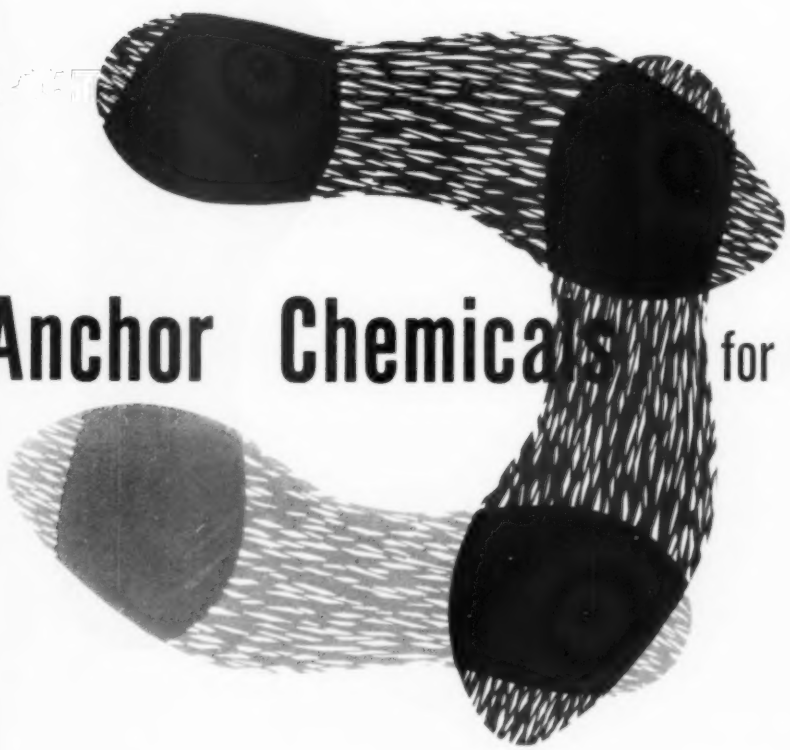
RUBBER and PLASTICS WEEKLY

VOLUME 141 NO. 8 JULY 29 1961 ONE SHILLING



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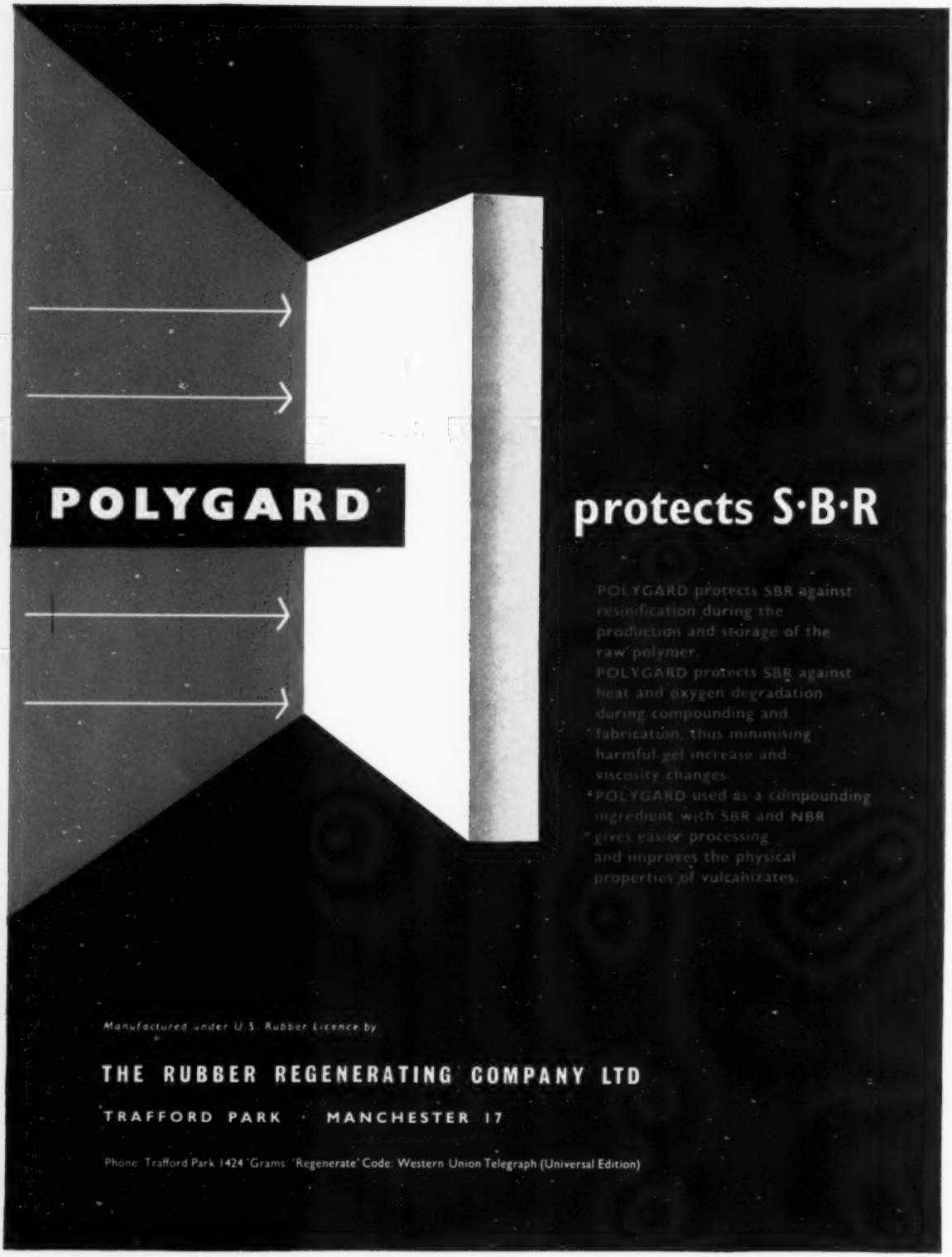
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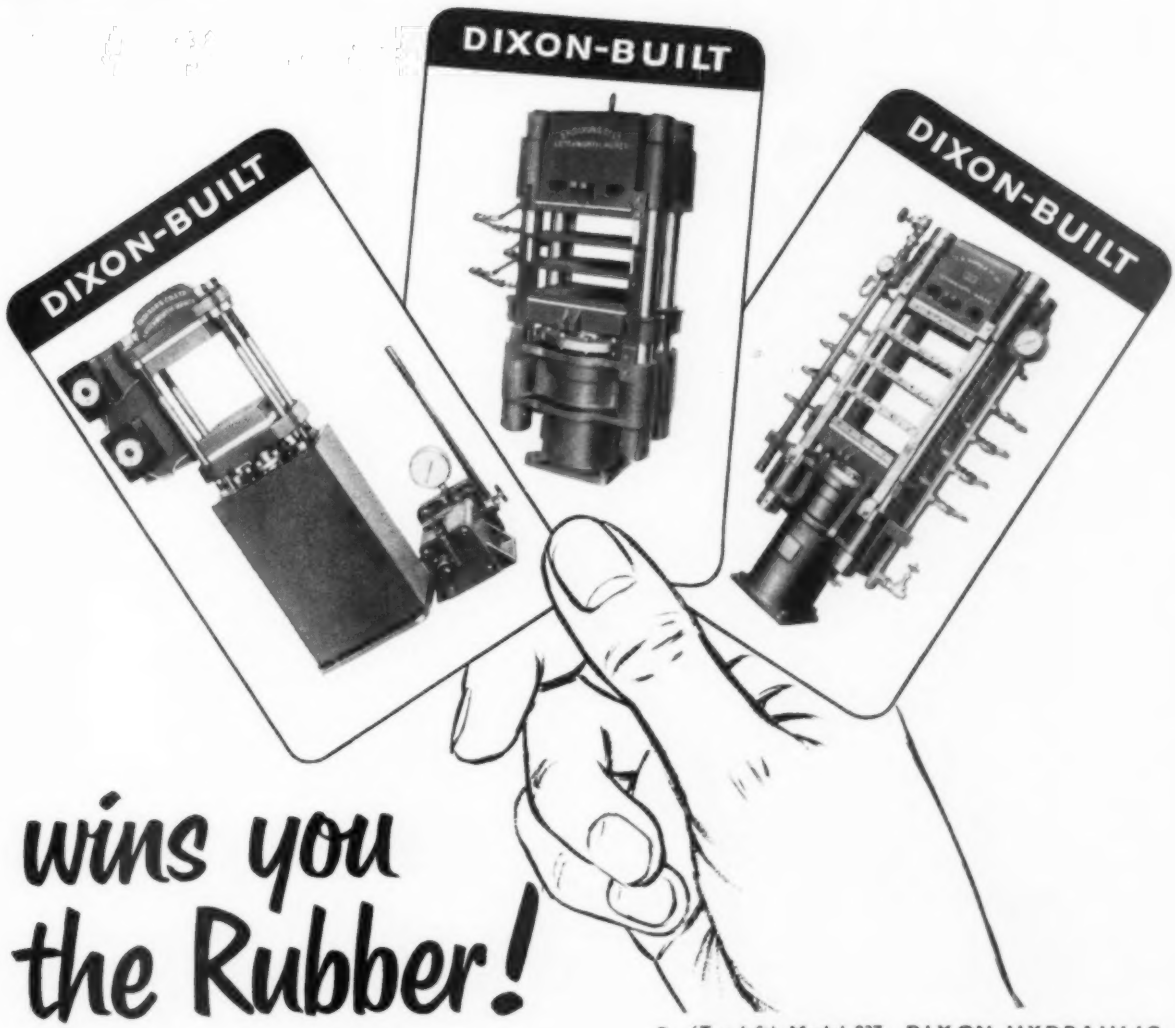

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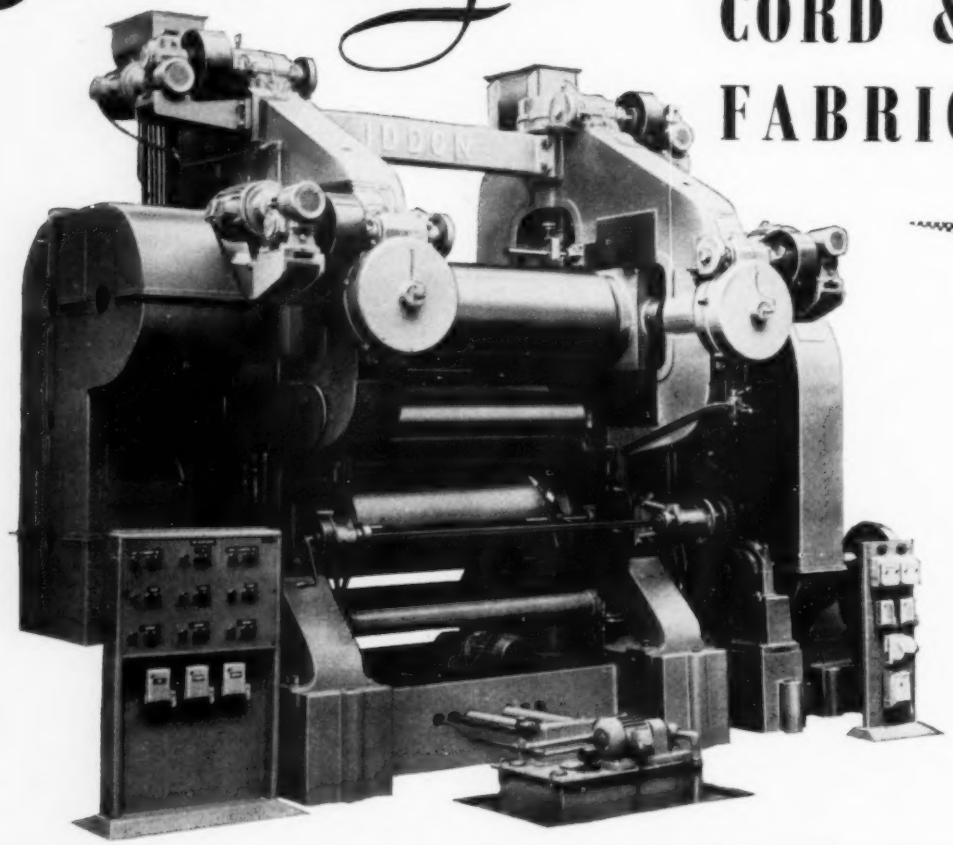

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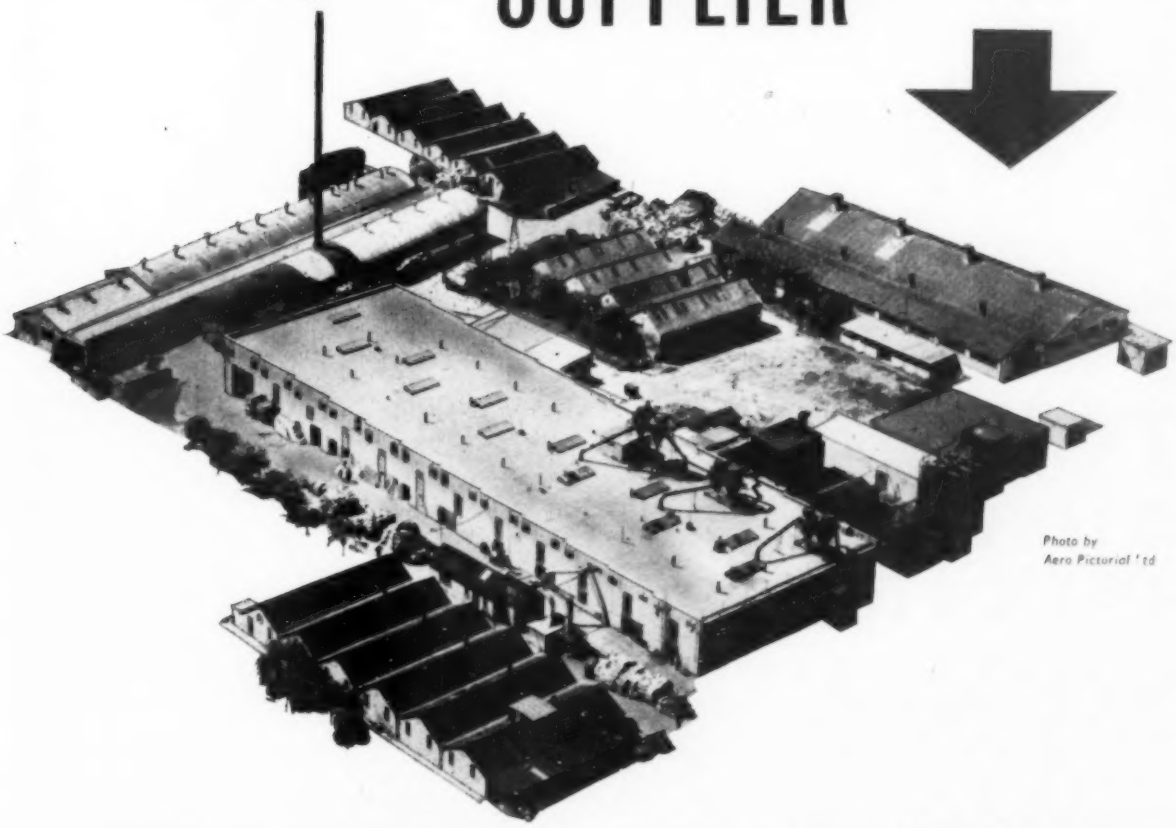

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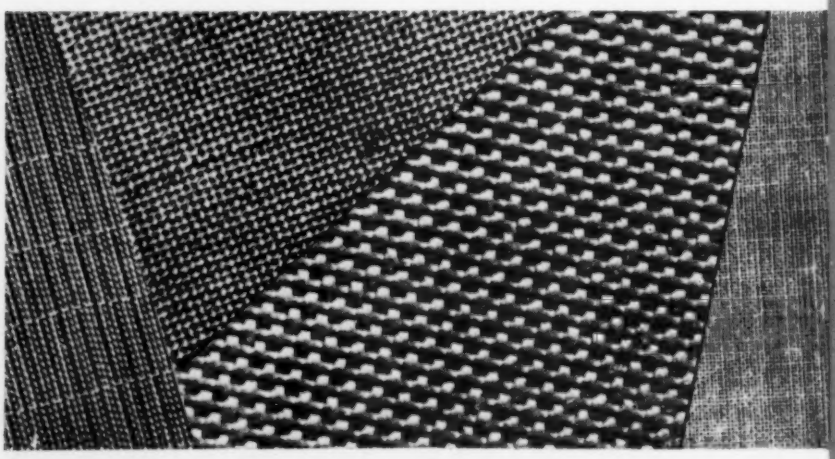

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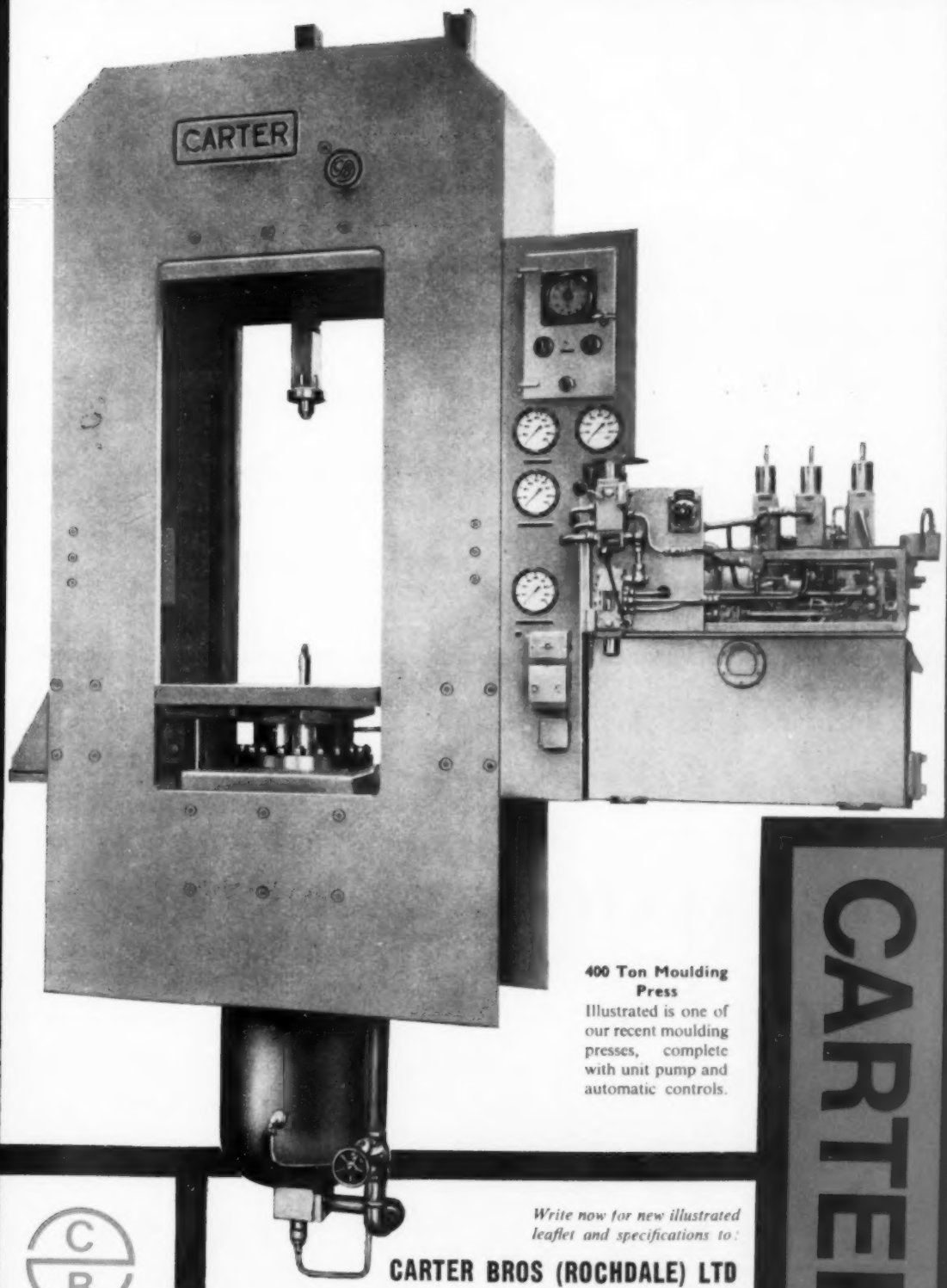

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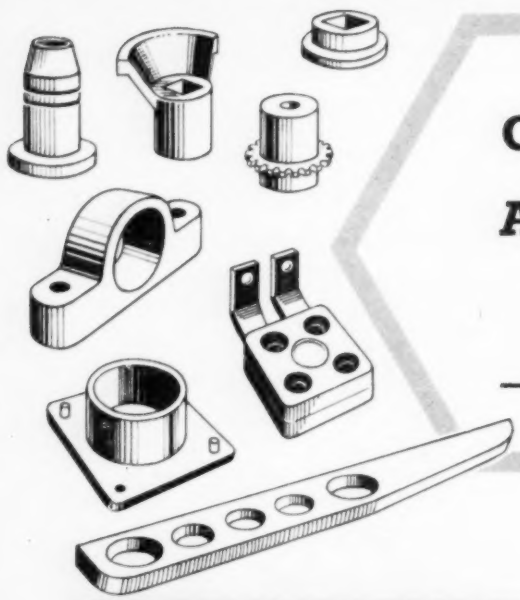

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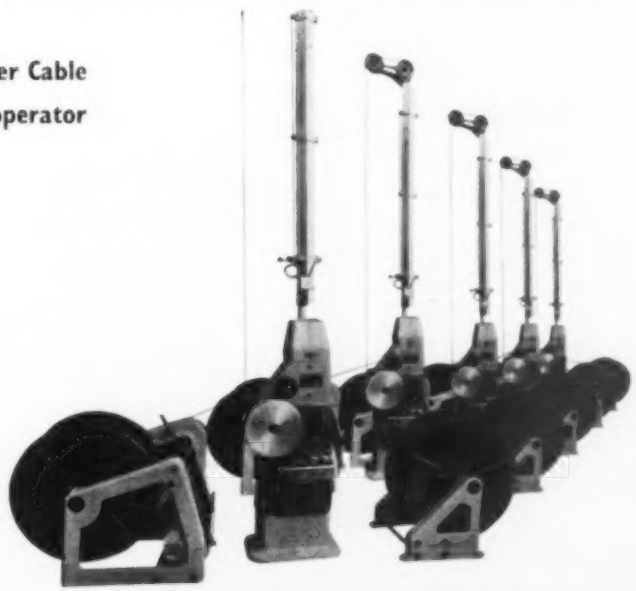

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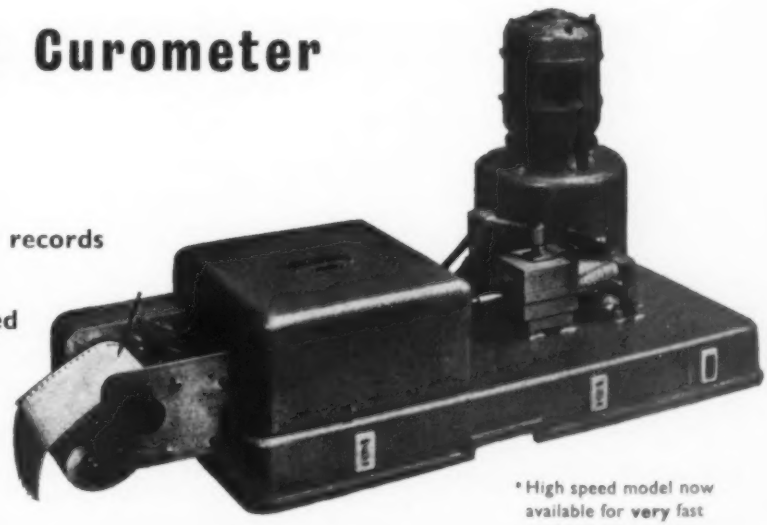

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Volume 141 IN ITS 77th YEAR No. 5

July 29 1961

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NOTES of the WEEK

Export Assistance

WHILE the Chancellor's 'little budget' is not as bad as was feared — manufacturers are relieved that there are no direct additions to the cost of production — it will hardly begin to solve our export problems. It seems that the Government has little to offer to exporters but exhortations. Some manufacturing interests are, however, taking a more practical approach. One of a number of recent moves of positive help towards raising our exports, which has received much less publicity than Mr. Lloyd, was the publication of an 'export assistance register' by the Institute of Directors. The register, published by the Institute's 'Export Action Now Committee', was compiled from answers to a questionnaire sent to its 37,000 members asking if their companies needed help to begin selling overseas — or were able to give it. Listed in it are about 600 companies — manufacturing more than 500 different main categories of goods — who have offered export assistance to non-competing concerns. These companies have undertaken to give free export help and guidance of a general nature, although specific propositions are a matter for individual arrangement.

The register is designed so that directors of firms seeking help can choose a 'guide' company, either by product or location, or can approach a company with a specialist experience of a particular territory overseas. A number of polymer firms are taking part in this unique combined effort, which is confined to the Institute's members. Perhaps when the results have been assessed this excellent scheme could be extended to industry as a whole.

Eliminate the Pence

THE co-operation implicit in the export assistance register reminds us of another type of co-operation between firms, suggested by I.C.I.'s D. F. C. Mann, chairman of the organization and methods division of the Institute of Office Management. He has put forward the idea that the pence should be eliminated from all inter-firm transactions, the shilling becoming the basic unit. Statistically the same overall result should be obtained — for much less office work. The move might seem a drastic one, but with our office population topping the 3 million mark, drastic moves are needed unless we are all to be buried beneath mounting piles of paper.

A Long Road for Rubber

WE spend a good deal of our lives on rubber. We walk, ride, sit and sleep on rubber — and in certain districts we can ride on rubber roads. But not as often as those of us with an interest in rubber would like. If only 20% of the UK's roads were made using rubberized binders, the application would absorb 5,000 tons of rubber. The drawback so far has been the initial expense: the small budget the UK allows itself for roads generally leads to the cheapest materials being chosen, even though a rubberized road might save money in the long run. Laying may also be more expensive, and the result is that the case for rubber has to be proved to the hilt before authorities will use it. But the case grows stronger every day, and it looks as if, in the next few years, natural rubber will draw the dividend of much research and promotional work it has carried out to put rubber into roads.

In fact, the 1960 report of the Natural Rubber Bureau, published this week, shows that increasing attention was paid during the year to rubberized roads. It refers to the recently developed method of preparing a rubberized cut-back bitumen, using latex, in which the temperature of mixing has been kept below that at which degradation on any appreciable scale will occur. By this means, a cheaper form of rubber used more efficiently has resulted in a more economic binder and the disadvantage of foaming, found previously with latex, has been eliminated.

The report quotes the use in Europe of several hundred tons of a rubber bitumen concentrate containing 31% rubber, cites control experiments that indicate the superiority of rubberized roads, and reminds us that many countries have installed them. There are rubberized roads in Canada, on the transcontinental highway where temperatures can be extreme in both directions, in Australia, New Zealand, and on the continent. Up to 60 miles of rubberized bitumen or tar surfaces were installed in the UK in 1960. But, in making its point, it has been a long research and promotional road for rubber. It is time that the Ministry of Transport paid more practical recognition to the results that have been obtained. We have not enough roads now; when we are building new ones, or repairing old ones, we should make sure that we build them to last. And that means using rubber.

NEWS *Briefs*

NEW GOODRICH DIVISION — BRAZIL SYNTHETIC PLANT — JABLO MALTA — BIP DUTCH AGREEMENT KUWAIT CHEMICAL PLAN — TRINIDAD PIONEER

●**Holland** — British Industrial Plastics Ltd. have made an agreement with NV Kleefstoffenfabriek Gebr. Struyck of Zutphen, for the manufacture of certain Beetle Coating Resins in Holland. Struyck are manufacturers of industrial adhesives which are sold under the trade name Strucol on the European market. Sales of Beetle coating resins in Holland will continue as before through BIP Chemicals Ltd.'s agents, Merrem and La Porte NV, of Amsterdam.

●**India** — East Anglia Plastics (India) Ltd., who recently received sanction for the manufacture of cellulose acetate moulding powders and pvc compounds (*RPW* May 27, 784) has now received an industrial licence to establish a new industrial undertaking in Andhra Pradesh for the manufacture of cellulose acetate flakes, acetic acid and acetic anhydride. The present expansion scheme will cost approximately £3.75m.

●**Kuwait** — An agreement has been signed between the De Nora Co., of Milan, with the Kuwait Government, for the manufacture of chemicals in Kuwait. A new corporation, in which De Nora will hold 40% of the stock, will produce raw materials for plastics, caustic soda, acetylene, oxygen, nitrogen fertilizers, and chlorine. The enterprise will utilize natural gas both for power and raw materials.

●**Trinidad** — Federation Chemicals, a Trinidad subsidiary of W. R. Grace and Co., New York, has applied for pioneer industry status for its project to produce methanol and resins for plastics. The proposed investment is reportedly about WI$21m. and the plants, to be completed in two years and to employ about 250 workers, will be constructed near the company's plant at Point Lisas, near Couva.

●**United States** — Sales by the B. F. Goodrich Co. to the Federal Government last year amounted to over $55m., 7.3% of BFG's total net sales. A new division of the company has now been formed to consolidate and co-ordinate all direct contract sales to the Defence Department and other Federal agencies. The new division is called B. F. Goodrich Aerospace and Defense Products and will be responsible for the sale to the government of a wide range of products including tyres, footwear, life jackets, exposure clothing and hose.

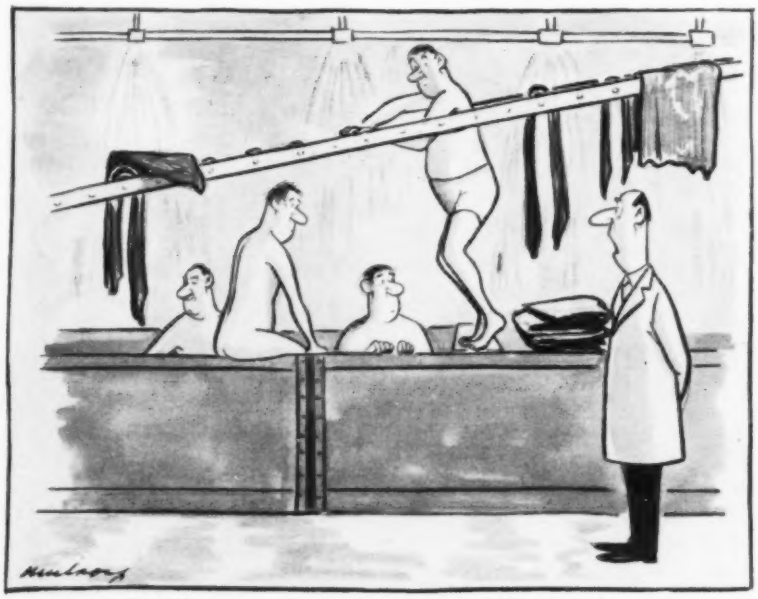
●**Japan** — Dowty Hydraulic Units has signed a licence agreement with Kayaba Industry Co., of Tokyo, for the manufacture in Japan of Dowty hydraulic gear pumps and motors. Manufacture will commence immediately and exclusive selling rights have been granted in Japan, Formosa, Korea and Indonesia.

●**Malta** — First exports of expanded polystyrene thermal insulation from Malta were made recently by Jablo Plastics Industries (Malta) Ltd. The company is operating a pilot plant factory for the manufacture of Jablite expanded polystyrene pending completion of their new factory in the Industrial Estate at Marsa. Original plans were for most of the Jablite produced in Malta to be exported, but demand for the material by building and refrigeration interests on the island has proved unexpectedly high.

●**Brazil** — Final plans for the installation of a new synthetic rubber plant in Pernambuco, near Recife, have been submitted by the State Government to Brazil's National Bank for Economic Development. The Bank is being asked to guarantee financing abroad of US$13m. and to lend the new company, the Cia. de Borracha Sintetica de Pernambuco, money to assist in the cost of construction. The new plant, which it is hoped will be completed in two years, will produce 27,000 tons of synthetic rubber annually by a process designed by Firestone, based on alcohol derived from sugar cane.

●**East Germany** — Humphreys and Glasgow, contracting engineers, has concluded a further agreement with the German Democratic Republic covering know-how and licences for a wide range of processes in the German chemical industry. These include the production of acrylonitrile, polyamide, polyester and viscose fibres. At the end of last year an agreement providing for the two-way purchase of chemical processes and information was reached between Humphreys and Glasgow and Limex, an East German trading corporation.

●**Russia** — Soviet trade organizations have placed an order for £1.5m. worth of machinery with John Dalglish, the Glasgow manufacturers of industrial drying equipment. The contract is for two complete plants for the filtration, drying and wrapping of butyl rubber. Deliveries will start next year. Earlier this year the company received a £200,000 Russian order for similar equipment to be delivered this year.



'OK fellers — nearly one o'clock — break it up now' — 547

Synthetic Widening the Gap

MALAYAN LATEX EXPORTS DROP 10%

THE proportion of synthetic rubber used in finished products last year increased compared with natural rubber, according to the annual report of the Natural Rubber Bureau.

'Coupled with expanding facilities for the production of synthetic rubber of various types, especially in Europe', the report comments, 'was the fact that the price of the natural product remained at a fairly high level during the greater part of the year and the incentive of consumers to utilize synthetic rubber at lower cost was predominant'.

The report goes on to point out that the market for natural latex was also 'seriously affected' by cheaper synthetic latices. Exports of rubber from Malaya as latex dropped over 10% compared with the 1959 figure.

'In the USA', the report adds, 'supplies of the new "stereo" rubbers, claimed to duplicate the properties of tree rubber, became available commercially on a limited scale. Consumption of all types of rubbers tended to fall away towards the end of the year, a reflection in particular of the recession in the motor car industries of the USA, UK, etc. This falling off carried with it its own corrective in that the price of natural rubber dropped to 24d. per lb. in December — its lowest for the year'.

Improving Competitive Position

Against this background the report details the activity that is taking place to improve the competitive position of natural, such as the role of the new Co-ordinating Advisory Committee for scientific research, and the further development of technical service. It notes that hundreds of visits to rubber manufacturers by the Bureau's technical service representatives overseas proved effective in increasing the utilization of SP rubbers and other new forms of rubber developed by the natural rubber research laboratories.

Good Progress

Good progress is recorded with the reorganization of the three research and development units for natural rubber (The Rubber Research Institute of Malaya, Kuala Lumpur, the Natural Rubber Producers' Research Association, Welwyn Garden City, and the Natural Rubber Bureau, London, and overseas), all now responsible directly to the Malayan Rubber Fund Board.

●A feature of the report is recent work on rubberized roads. See page 149.

Resignations from Kleemann Board

Following the successful bid by Mobil Holdings Ltd. for O. and M. Kleemann Ltd., Derrick Kleeman has joined the board of Mobil Holdings.

J. Kleeman, H. Hock, F. Hock and Sir Bernard Waley-Cohen have resigned from the Kleemann board, to which R. B. Madden and P. B. Unwin have been appointed.

Isoprene Down

Shell Chemical Co. Ltd. has cut the price of its Cariflex polyisoprene isoprene rubber by 3½d. a lb. to 26.50d. a lb. ex store.

250 Miles of Cables for BEA

British Insulated Callender's Cables Ltd. has supplied about 250 miles of various types of cable for the new engineering and maintenance base which has recently been completed for British European Airways at London Airport at a cost of £6m. The order is worth about £800,000. The cables include: pvc insulated and pvc wire armoured and pvc sheathed.

The building of the base is said to have been one of the most highly mechanized and precisely engineered operations in the history of British building.

Rubber Wages Snatch

A car taking about £6,000 worth of wages to the High Wycombe factory of Long and Hambly Ltd. last week was rammed and the money snatched by a gang of four men, who escaped in a waiting van.

Treloar Awarded the Colwyn Medal

DR L. R. G. Treloar, formerly senior physicist at the British Rubber Producers Research Association (now the Natural Rubber Producers Research Association), has been awarded the Colwyn Medal by the Institution of the Rubber Industry.

The Hancock Medal has been awarded by the IRI to Mark M. Heywood, technical director of P. B. Cow and Co. Ltd., for 'outstanding services to the Institution and the industry'.

The Colwyn Medal goes to Dr Treloar 'in recognition of his conspicuous work on rubber physics, his outstanding contributions to the understanding of rubber-like elasticity and researches on the elastic behaviour of high polymeric materials'.

Dr Treloar is one of the leading authorities on the physics of rubber. During 1953-5 he was president of the British Society of Rheology, which is concerned with the study of all aspects of the deformity of materials. From 1938-49 he was senior physicist at the BRPRA and since 1949 has occupied a similar position at the British Rayon Research Association (now merged into the Cotton, Silk and Man-made Fibres Research Association, Shirley Institute, Manchester). While working at the latter he has continually made researches of the elastic behaviour of high-polymeric materials.

Dr Treloar is the author of some 50 papers and publications of rubber physics, and his book 'The Physics of Rubber Elasticity' is the standard work on the subject.

Mark Heywood has an international reputation as a rubber technologist, and has been connected with the industry for more than 40 years. He is a member of many professional institutions, and a Fellow of the Royal Institute of Chemistry and the Institution of the Rubber Industry. He is a council member of the IRI, and has served on the education committee and various other committees.

He was one of the founder-governors of the National College of Rubber Technology.

●The IRI has also made the following appointments. New Fellows: C. H. Leigh-Dugmore, S. H. Morrell, R. H. Norman, V. R. Sharma, A. R. Soden, W. G. Wren and E. R. Gardner. Elected to the honorary Fellowship: H. C. Young. Admitted to the Associateship: D. K. Roychaudhuri. Elected to long service membership: E. R. Bridgewater.

C. B. COPEMAN

We regret to announce the death of C. B. Copeman, who for ten years was chairman of Maclaren and Sons Ltd., publishers of *RPW*.

Only last year Mr Copeman was awarded the Hancock Medal by the Institution of the Rubber Industry for outstanding services to the industry. An obituary appears on page 160.

STABILIZERS FOR PVC — PART 5

Commercial Stabilizers

A WIDE AND INCREASING RANGE OF PRODUCTS AVAILABLE

By W. S. PENN, BSc.

This is the fifth article in a series of six and includes a review of the pvc stabilizers manufactured in the UK. Products of foreign origin are not generally mentioned and, while it is not claimed that all commercial stabilizers available are mentioned, the list has been made as complete as possible

ALTHOUGH it is unusual in articles of this type to review suppliers' products it becomes unrealistic to omit them in certain cases. A number of valuable stabilizers, for example, the epoxy compounds, cannot by their very nature be sold as pure chemicals but have to be sold as proprietary materials. The present article is therefore a review of the British stabilizer industry.

Commercial stabilizers may be divided into two kinds (a) relatively pure chemicals most of which have been described in previous articles and (b) mixtures of undisclosed composition sold under trade names. Indications of the sources of both types will be given.

In view of the large range of stabilizers available under (a) it may seem superfluous to produce the rather nebulous mixtures sold under (b). However, no stabilizer satisfies all requirements and the mixtures are arbitrary attempts to impart as many properties as possible to one material. Some are most successful and this applies particularly to barium/cadmium/zinc, etc., complexes which are now available to suit most applications. Many are described in the present article but they are developing continually and the preferred supplier should be contacted for the latest information.

Special Products

The commercially available materials are of the greatest value to users. The larger suppliers are clearly in a better position than most consumers to study stabilizers in detail and have an extensive background of experience. They are also always prepared to investigate new problems and may well develop new products to overcome a consumer's difficulty.

Although the present article is fairly complete as far as the British industry is concerned, the following points are stressed. The list of suppliers is not guaranteed to be complete; the products of agencies or of foreign origin are usually omitted; any omission does not imply that such goods are inferior to those included and in any case there is no direct comparison or implied comparison between any materials. Finally, the products of suppliers are changing continually and the preferred supplier must always be consulted for the latest details.

Table 1 gives a list of those suppliers considered in the present article together with some of their best-known trade names.

TABLE 1
SOME SUPPLIERS OF STABILIZERS

Supplier	*Trade Names*
Albright and Wilson (Mfg.) Ltd. ..	Mellite.
Associated Lead Manufacturers Ltd.	Trade names not normally used except Tri-klar.
F. W. Berk and Co. Ltd.	Various, such as Flomax, Nalzin, Provinite, Clarite and Temex.
A. Boake, Roberts and Co. Ltd. ..	Trade names not normally used except Abrac 'A' and 'C'.
Cyanamid of Great Britain Ltd. ..	Cyasorb.
Durham Raw Materials Ltd. ..	Durostabe and Nuostabe.
Kingsley and Keith Ltd.	Advastab.
Lankro Chemicals Ltd.	Lankro Mark M., etc.; Lankroflex ED3.
Mersey White Lead Co. Ltd. ..	White Lead.
Novadel Ltd.	Estabex.
Pure Chemicals Ltd.	Stanclere and Ferroclere.
Rubber Regenerating Co. Ltd. ..	Polygard.
Theodore St. Just and Co. Ltd. ..	—

Some of these suppliers offer the pure chemicals already described, some the proprietary mixtures and some both. The precise function of each supplier is described in this article with examples of their products.

Albright and Wilson (Mfg.) Ltd.

A range of products is manufactured under the trade name Mellite although some of the products such as Mellite 103, 133, 135 and 810 are pure chemicals these being zinc octoate, DBTL, DBTM, and triphenyl phosphite respectively. The company specializes in organotin compounds and a number of cadmium/barium complexes.

The following materials in particular should be noted. Mellite 101, a co-precipitated barium/cadmium laurate; Mellite 112, a liquid maleate and Mellite 35, a solid thio tin stabilizer specially for rigids. There are also other products.

The very useful liquid products should be noted. Zinc octoate can be used to improve the stability of calcium stearate and 5% of the stabilizer should be replaced. This may be done in plastisols as well as flexible products. Mellite 166 (a zinc complex for barium/cadmium systems) helps reduce plate-out and the addition of 1.0 pure Mellite 101 to 7.0 parts white lead in electrical compounds improves resistivity. Where phosphate plasticizers are used in clear electrical compounds a thio tin compound is to be preferred, an example being Mellite 131, this particular stabilizer requiring a lubricant. In the production of such clear compounds it should be noted that emulsion polymers do not give maximum clarity.

Associated Lead Manufacturers Ltd.

Most of the products of this company are sold under the chemical names. One exception is Tri-klar, a complex metallic soap.

Basically the company produces lead and certain other metal compounds as follows: basic lead carbonate; dibasic lead phosphite; tribasic lead sulphate; lead silicate; dibasic lead stearate; lead stearate; cadmium, barium and calcium stearates.

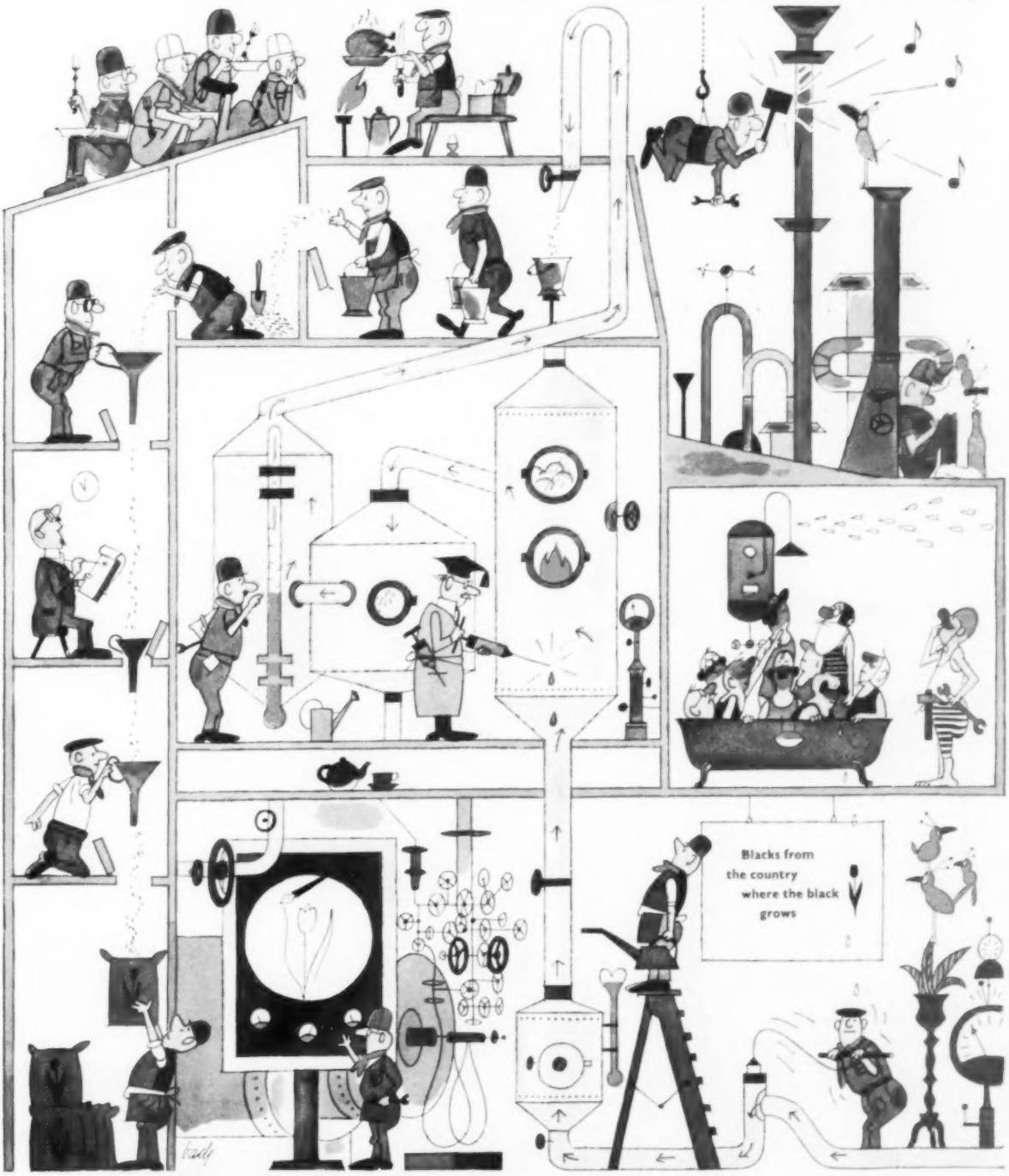
The properties of all these stabilizers have been described in previous articles.

F. W. Berk and Co. Ltd.

This company produces a range of lead and other metallic salts which are also made by the National Lead Co. of the USA under the same trade names.

Flomax; Nalzin; Provinite and

KETJEN CARBON's modern plant serves the rubber industry



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Clarite and Temex are barium/cadmium, zinc and barium cadmium complexes, and barium/zinc complexes respectively. Dibasic lead phosphite; dibasic lead phthalate; lead ortho silicate and silica gel (Plumb-O-Sil) and a complex barium silicate (Bar-O-Sil) are also manufactured by this company.

Bar-O-Sil should not be used alone as it is a secondary heat stabilizer. It may be used in quantities of 1-4 / with 'combination' stabilizers to reduce plate-out and dry-hand. Temex 3 is specially designed for vinyl/asbestos floor tiles to provide complete freedom from sulphide staining and to give good light stability. The Clarites are heat and light stabilizers for extruded and moulded clear products. CX137, a barium/sodium organic complex, is an antioxidant/light stabilizer for good weathering resistance; Flomax 25 is a liquid stabilizer and Nalzin is a supplementary stabilizer for barium/cadmium types to resist sulphide staining.

A. Boake, Roberts and Co. Ltd.

Abrac manufacture some speciality stabilizers (the epoxidized oils and esters) and some standard types including barium, calcium, lead, lithium, magnesium and zinc stearates and glycerol mono-oleate.

Abrac 'A' and 'C' are the well-known epoxidized oils and esters respectively. The 'A' is a pale-coloured liquid which is easy to incorporate and disperse and gives clear products. It is also a partial plasticizer and thus replaces part of the conventional plasticizers and is usually used to the extent of 5.0-7.0phr — in conjunction with other stabilizers.

It has the usual properties of epoxy products but the following may be mentioned in particular. Abrac 'A' improves the heat stability of antistatic compounds, and has a stabilizing effect on alkyl and aryl phosphates and chlorinated waxes. It is useful in electrical compounds and detracts little from electrical properties. A good combination is provided by a mixture with lead silicate or dibasic lead carbonate. To avoid corrosion in contact with copper, iron or steel, the metallic stearates should be kept as low as possible and since Abrac 'A' is neutral at all times it is very useful in such compositions. The material can be used in rigid compounds, plastisols and organosols but should not be used as the sole plasticizer for these products since the pastes become too viscous.

Cyanamid of Great Britain Ltd.

This company does not produce stabilizers as such. However, it produces a range of UV light absorbers under the name Cyasorb and these have been fully covered in a previous article.

Durham Raw Materials Ltd.

This company manufactures a wide range of Group II and Group V stabilizers. The Durostabes are solids and mainly metal soaps and the Nuostabes are liquids for ease of incorporation.

The standard products in the Durostabes include barium, cadmium, calcium, lead (normal and basic), lithium and strontium stearates; barium ricinoleate, cadmium laurate and lead silicate. Some typical mixtures include Durostabe S50 (barium/cadmium laurate); Durostabe S55 (barium/cadmium complex soap) and Durostabe S57 (a calcium/zinc complex soap) which can be used satisfactorily in emulsion and suspension type polymers.

Some examples of the liquid Nuostabes are as follows: V132 is a barium/cadmium complex; V205 is an epoxy compound and V12 and V14 are barium/zinc complexes; V142 is an organic chelator; V152 is a zinc complex. Nuostabe V-132 is a useful stabilizer for many applications. As a liquid (SG 1.018) it may easily be incorporated and gives excellent initial colour and outstanding resistance to heat and light particularly with suspension polymers. Stearic acid should be incorporated with it except in plastisols and organosols. Epoxy stabilizers further improve heat and light stability. In sheets there is no initial yellowing of the film, heat-sealing and printing are good and it is useful in formulations where plate-out troubles are experienced. In the case of Nuostabe V-152, it is not a stabilizer on its own account but is to be used synergistically with others. For normal purposes the concentration should not exceed 0.5phr.

A few examples of formulations employing the Durham stabilizers are given in Table 2.

In (7) and (8) copper staining is eliminated because of the complete dispersion achieved. This means that there are no unstabilized areas which can attack the copper face of the mould (in slush moulding, etc.).

Kingsley and Keith Ltd.

This company is the sole distributor for the Advastab stabilizers of Advance International Ltd., Advastab 17M is a tin mercaptide stabilizer for clear rigid compounds where heat histories are long. Advastab 17-MO is a non-toxic stabilizer, Advastab CZ11 is a non-toxic calcium/zinc paste, Advastab BC206 is a liquid barium/cadmium complex for plasticized calendering or extrusion compounds and Advastab BC26 is a powdered barium/cadmium complex for use in the production of semi-transparent or pigmented pvc. It has very good light stability.

Lankro Chemicals Ltd.

This company manufactures a wide range of stabilizers under the trade name Lankro Mark with the exception of the epoxidized ester Lankroflex ED3. Most of the products are based on combinations of barium, cadmium and zinc although Lankro Mark X and A are alkyl tin mercaptides and Mark E is a strontium-zinc laurate which has low toxicity and complete freedom from sulphide staining.

Among a wide range of barium/cadmium/zinc combinations it is useful to consider some standard products and how universally they may be used. Lankro Mark M is a liquid barium/cadmium complex which has

TABLE 2

	Formulation	*phr*	*Comments*
(1)	Durostabe S50	1.5	For calendered sheet.
	Nuostabe V142	0.5	
	Paraplex G62	3.0	
(2)	Durostabe S50	1.5	For formulations with high phosphate plasticizer content.
	Nuostabe V142	1.0	
	Paraplex G62	5.0	
(3)	Durostabe S55	0.6	For crystal clear compounds.
	Nuostabe V142	0.35	
	Nuostabe V205	0.5	
	Stearic acid	0.25	
(4)	Durostabe S55	4.0	For rigid pvc.
	Nuostabe V205	1.0	
(5)	Durostabe S57	2.0	For plastisols and organosols.
	Nuostabe V142	0.5	
	Paraplex G62	0.5	
(6)	Nuostabe V132	1.5	For clear extrusions the haze following extrusion disappears within 24 hours.
	Stearic acid	0.5	
	Nuostabe V205	1.0	
(7)	Nuostabe V132	3.0	For plastisols, giving good stability at fusion temperatures of 350 F.
	,, V205	1.0-2.0	
(8)	Nuostabe V132	1.5	As for (7). If fusion temperatures of 400 F.-450 F. are required, increase the V132 to 2.5 parts.
	,, V152	0.5	
	,, V142	0.5	
	,, V205	1.0-2.0	

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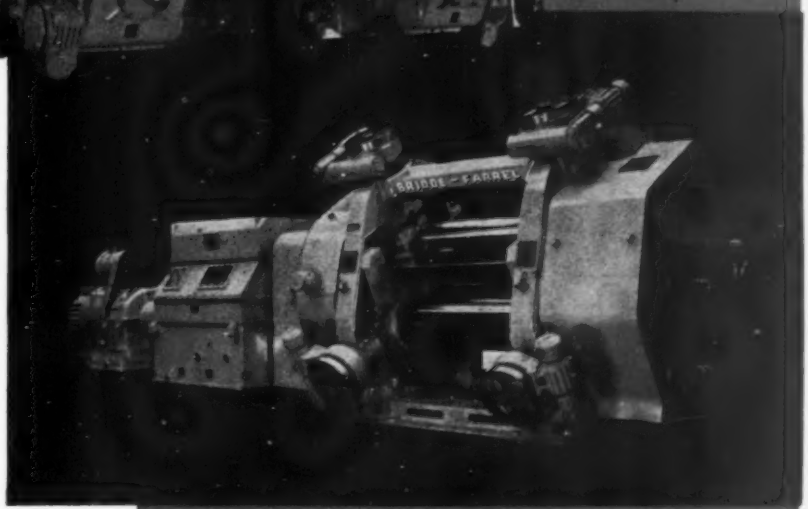

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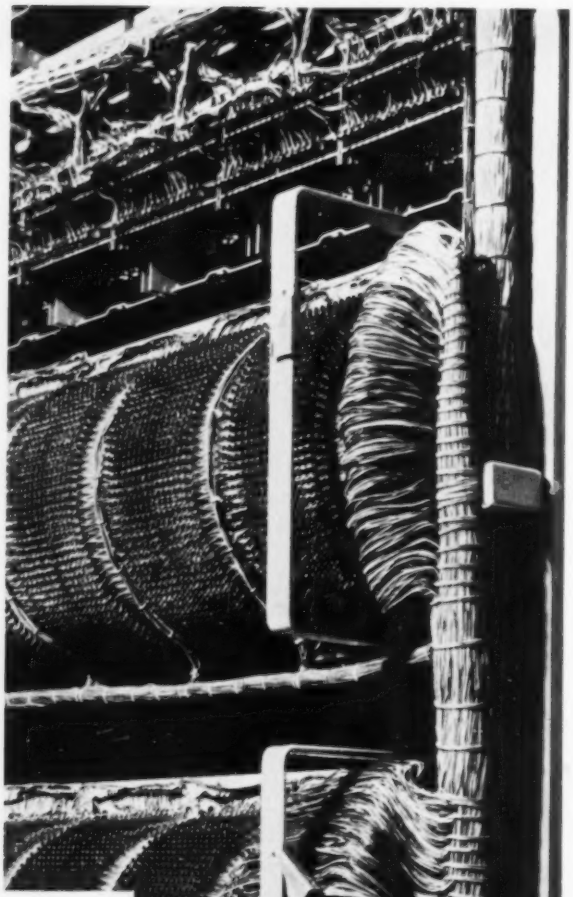
In Continuous technical association with the FARREL-BIRMINGHAM CO. INC., U.S.A. for over 40 years on the BANBURY MIXER and special machines



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and straightaway, a lot of highly-complex telecommunications machinery starts working for you. But, through all its complexities, there is a recurring factor: insulation. Particularly important is the choice of stabiliser. Berk supply many types of PVC stabilisers, three of them specifically for electrical insulation. These are:

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(tribasic lead sulphate) The best general purpose stabiliser—complete freedom from gassing. Excellent for electrical insulation and rigid articles.

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(dibasic lead phthalate) The stabiliser for electrical insulation which operates at high ambient temperatures. Also for activating and stabilising P.V.C. 'foam-back' textiles.

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the advantage of not being a soap; Mark PL is a zinc complex for synergistic use with Mark M; Mark WS is a solid barium/cadmium complex specially designed for calendering or extrusion of rigid pvc; Mark C is a liquid chelator and Mark 225 is specially designed for vinyl/asbestos tiles.

Mark M has outstanding resistance to heat and light degradation. The initial colour is good, yellow undertones do not develop with high temperature processing and it maintains the true tones of sensitive pigments. Mark M is not a soap and thus keeps plate-out to a minimum. It is an all-liquid phenate system and the alkyl phenol produced as a by-product of stabilization itself acts as a stabilizer. Some applications require the addition of Mark PL and to this combination is added Mark C for maximum stability and clarity.

It is recommended that stearic acid (lauric or myristic) is used with Lankro stabilizers except in plastisols. It exerts a synergistic effect with many mixtures and acts as a lubricant. Mark M has no lubricity and therefore controlled lubrication can be effected by the addition of stearic acid. Only 0.25-0.5 is normally required and calcium stearate and like products should not be used. The substitution of 3.0-5.0phr of plasticizer with Lankroflex ED3 is specifically recommended with Mark M.

Mark WS is a solid barium/cadmium complex specially for calendering and extruding rigid pvc, although it can also be used for flexibles where long term stability is required. In such a case the use of an epoxy is recommended. Mark C is an efficient organic chelator suitable for all materials and is particularly useful with Mark WS.

Some typical formulations using the Lankro stabilizers are given in Table 3. In the case of the vinyl/asbestos flooring, all the ingredients should be pre-dispersed in the Banbury before the addition of the asbestos.

The Mersey White Lead Co. Ltd.

This company manufactures a specially prepared lead stabilizer known as White Lead. It is a hydroxy-carbonate of lead and although it is a chemical compound, for heat stability purposes it can be regarded as an intimate mixture of lead hydroxide and lead carbonate, the proportions of which can be controlled. It is also available as a dispersion in a plasticizer.

The white lead stabilizers are made in several grades, the principal differences being the particle size and shape and chemical composition. The two most common are known as 'medium stain' and 'high stain' and for stabilization purposes, the high stain can be regarded as providing the longer heat stability time.

Novadel Ltd.

This company manufactures some standard lead stabilizers and a number of proprietary products under the trade name Estabex.

The standard lead products are as follows: Basic lead carbonate; dibasic lead stearate; lead stearate; dibasic lead phosphite; tribasic lead sulphate; lead silicate and tribasic lead maleate.

Estabex 2307, 2310 and 2311 are epoxidized products; Estabex BC 158 is a co-precipitated barium/cadmium soap; Estabex 401 and 402 are chelating agents and Estabex Z20 is a zinc complex.

Estabex 2307 is used in the same way as other epoxy types but it is also useful in pvc/pva polymers for solution purposes. BC-158 is used alone (3-5phr) or with zinc complexes, chelators, epoxy types exactly as with similar soaps. An example is a non-sulphide staining mix below:

Estabex 2307	5.0
Estabex BC-158	2.0-3.0
Estabex 220	0.2-0.5

Estabex 401 is preferably used at processing temperatures below 175°C. and 402 for higher temperatures. A quantity about 50% of the barium/cadmium stabilizer is usually sufficient. Of the two epoxy stabilizers the 2310 is best for heat and light stabilization and the 2311 to give least yellowing. Estabex 2375, an epoxy stabilizer/plasticizer, is particularly suitable for low temperature applications.

TABLE 3

Vinyl/Asbestos Tile

Polymer	50.0phr
Asbestos	50.0phr
Calcium carbonate	80.0phr
DOP	6.0phr
Lankroflex ED3	6.0phr
Titanium dioxide	6.0phr
Mark 225	3.0phr

Translucent and Opaque Rigid

Mark WS	3.0phr
Mark C	1.0phr

Calendered Products

Polymer	100.0phr
Phthalate plasticizer	20.0-35.0phr
Lankroflex ED3	5.0phr
Mark M/Mark PL	1.5-2.5phr
Mark C	0.0-0.75phr
Stearic	0.5phr

Crystal Clear

Mark M	0.75phr
Mark PL	0.25phr
Mark C	0.5phr
Stearic acid	0.5phr

Pure Chemicals Ltd.

This company manufactures two primary ranges of plasticizers, Stanclere organic tin stabilizers and Ferroclere principally barium/cadmium types manufactured under licence from the Ferro Chemical Corporation, USA.

The Stanclere range is a series of tin stabilizers of which the following are some typical examples. Stanclere DBTL is a liquid modified dibutyl tin dilaurate; Stanclere 10 is a synergistic mixture of organotin, barium/cadmium soaps and epoxy compound; Stanclere 40 is a non-sulphur organotin approaching mercaptides in performance but having no unpleasant smell; Stanclere 70A is an unsaturated di-alkyl tin salt and Stanclere 80 has the non-toxic di-n-octyl tin oxide as a base.

Stanclere DBTM is particularly suitable for unplasticized injection moulding and withstands temperatures up to 200°C. It tends, however, to be a little incompatible and will exude if used in too high concentrations. Stanclere 10 is an interesting synergistic mixture with barium and cadmium soaps and is particularly useful for clear coatings spread on decorated textiles. Stanclere 70A is suitable for unplasticized extrusion and calendering compounds, particularly gramophone records and in organosols has achieved notable success in high temperature rotational castings. Stanclere 80 is an excellent all-round stabilizer and is also non-toxic.

Ferroclere 42 is a barium-zinc combination with light stabilizing properties; 190 is a barium/cadmium complex; 203 is a solution of cadmium octoate with chelator and antioxidant; 903 is an aryl phosphite chelator; 1212A is a barium/cadmium stabilizer with additives; 1234 is a barium/cadmium/zinc complex and 1820 is a co-precipitated barium/cadmium soap with additives.

The Rubber Regenerating Co. Ltd.

This company produces Polygard which consists of tri (nonylated phenyl) phosphite. It cannot be used as a stabilizer alone but as a chelator used synergistically. Quantities up to 1.0phr are used, small quantities quite often being effective.

Theodore St. Just and Co. Ltd.

This company manufactures a range of metal soaps including barium, cadmium and zinc laurates and barium and lithium ricinoleates.

Conclusions

Two important points emerge from this study of commercial stabilizers. First, there is a wide range of products

Continued on page 190

THESE ARE NONOX *DAYS*

Industry constantly seeks to improve its processes, to find new methods and products even more suited to the demands of modern times than those already in use. This urge to advance has included a great deal of research in the field of antioxidants for rubber, work that has continued over the past 30 years in the laboratories of I.C.I.

Antioxidants for rubber are conventionally divided into two classes, the non-staining and the staining. The non-staining types are in particular demand for use in light-coloured rubber articles because they cause very little discoloration on exposure of the article to light.

Whereas staining antioxidants are predominantly aromatic amines, most non-staining antioxidants are phenolic. Relatively simple phenols are, in fact, antioxidants. Some 30 years ago I.C.I. were early in this field with their product Nonox W, essentially β-naphthol. This has since been replaced by a range of non-staining antioxidants of greater flexibility and efficiency.

It was found possible to avoid the known retarding effect on vulcanization of simple phenols by the use of more complex phenol derivatives. Nonox NS, and Nonox NSN which later supplemented it, are both of this type and were first developed in the 1930s. The non-staining properties of these products proved extremely good and further developments were aimed principally at gaining increased efficiency.

Notable advances were made during the second world war but it was not until 1948, when Nonox EX first became available, that these could be implemented. Although not quite maintaining the excellent non-staining properties of Nonox NS NSN, Nonox EX gave significantly greater efficiency and set a pattern for more widespread use of non-staining antioxidants by the rubber industry. Similar products are Nonox EXN and EXP which differ from Nonox EX principally in physical form. Nonox EXP, in particular, provides a most attractive bead-form which is easily and cleanly handled.

Remarkable for the combination of efficiency with excellent non-staining properties is Nonox WSL. Although differing chemically, Nonox WSL is a substituted phenol, and resembles Nonox EX in all fields of efficiency except possibly heat resistance. A later product, Nonox WSP, is chiefly of interest because of the high degree of protection that it confers. Nonox WSP and WSL have proved of particular value in latex articles (such as foam) and mechanicals. It may be noted that Nonox EX EXN EXP are resinous and not easily used in latex processes.

The latest addition to the I.C.I. range is Nonox CNS. This product was developed principally as a non-staining copper inhibitor, i.e. an agent that counteracts the deleterious effects of metals such as copper and manganese on the ageing of rubbers. Nonox CNS is a synergistic mixture of, essentially, two agents, one reinforcing the effects of the other. Non-staining copper inhibitors are of interest in the manufacture of cable insulation and proofings. Nonox CNS is also a most effective antioxidant.

The I.C.I. range of non-staining antioxidants will not stand still. Out-dated products will be deleted and new products added as discoveries are made. The progress since the days of Nonox W has been substantial.

IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.I

Advertiser's announcement, X193

The frog in the well

knows nothing of the great ocean

The science and technology underlying non-staining antioxidants is indeed a great ocean of knowledge and experience, the depths of which can be plumbed only by the largest organisations equipped with specialized resources.

I.C.I. technical service, backed by thirty years' continuous research in the development of NONOX non-staining antioxidants, embodies the widest possible range of experience, and can be relied upon to give accurate information and sound technical advice. The products on the NONOX range are supported with detailed technical literature, and the service of I.C.I. rubber technologists, which is second to none, is available to all rubber manufacturers.

IMPERIAL CHEMICAL INDUSTRIES LIMITED
LONDON SW1 ENGLAND

ICI

X143

Obituary

C. B. Copeman

IT is with deep regret that RUBBER AND PLASTICS WEEKLY has to record the death of C. B. Copeman who, for ten years, was chairman of Maclaren and Sons Ltd., publishers of *RPW*. He died peacefully in his sleep at his home, Headlands, Southcliff, Bexhill-on-Sea, early on Friday July 21. He was 74.

C. B. Copeman had been associated with Maclarens for almost 55 years. Until a few months ago he was its chairman, which office he occupied following the death of J. H. Macadam. It was due to the deterioration in his health that Mr Copeman gave up the chairmanship and was succeeded by his son, Frank Copeman.

During his long association with the firm, Mr Copeman became well known to very many readers of its various publications, for he took a keen interest in the affairs of the trades with which the publications of Maclarens were concerned. But his closest personal link was with RUBBER AND PLASTICS WEEKLY and other publishing work in any way identified with the rubber industry.

In the days before the formation of the Institution of the Rubber Industry (when RUBBER AND PLASTICS WEEKLY was *The India-Rubber Journal*) he identified himself with the Rubber Club, a movement which gave way and led to the birth of the Institution of the Rubber Industry. He was a founder member of the IRI and a member of its council for many years; he also served on many IRI committees.

Last year Mr Copeman was awarded one of the industry's two highest honours — the Hancock medal. This was presented to him for 'outstanding service to the industry and to the Institution since its inception'.

Although in business he was more closely associated with the advertising department and the firm's representatives, C. B. Copeman always had an eye for a story and was a great help to all editorial departments. In the administration of the firm he was greatly esteemed by all members of the staff for his kindly manner and sympathetic approach to anybody in trouble and his willingness to help all members of the staff no matter how humble a position a person may have held. Yet, withal, he was a strong administrator, a man with vision and foresight. Of later years he had taken a lesser amount of responsibility in the administration of Maclarens.

C. B. Copeman was the elder son of the late Frank Copeman, a former chairman and managing director of the company, who, in the early days of the business, was in partnership with the founder, W. F. de Bois Maclaren, who became the first chairman when the business, which originated in Scotland, was converted into a limited company. Following the death of Mr Maclaren, Frank Copeman succeeded to the chairmanship and at his death the late J. H. Macadam (father of Mrs Harold Copeman), whose long service with the company was mainly directed to the editorial side, became chairman and managing director. C. B. Copeman was appointed a director of the company in March 1919, vice-chairman in May 1927, and chairman in February 1951.

He was educated at Dollar Academy and afterwards on the Continent. He spent much of his time travelling in the UK and on the Continent and also visited USA and Australia in the firm's interests.

Mr Copeman, in addition to his business activities, was concerned with many social and educational functions, particularly in Essex where he lived for very many years. At his Shenfield home he had a fully-equipped theatre in the grounds and, for a number of years, he organized private theatricals. During the last war he was Superintendent of the Essex Special Constabulary, a position he held for nearly 21 years. He was also chairman of the Governors of the County High School, Brentwood, and, even after he moved to Bexhill, he retained his interest in the school.

Very much the family man, C. B. Copeman devoted a great deal of his time to his children and grandchildren.

He leaves his two sons, Frank and Derek, and a daughter Jennifer, now Mrs Hewitson. Mrs C. B. Copeman died on May 29 1960.

A funeral service was held in Bexhill on Wednesday July 26, followed by interment at the family grave at Brentwood Cemetery.

G. E. Holmes-Siedle, secretary and registrar of the Institution of the Rubber Industry, writes:

The death of C. B. Copeman has deprived the Institution of a foundation member whose help and wise counsel were readily available at all times during 40 years of close association. He had been a member of the council and of its committees off and on through the years, and his kindly personality had earned him the warm affection of his colleagues.

In a speech of thanks for the Hancock Medal awarded him last year he said that a happy life could be measured by friendships made — and no one had a wider circle of friends than he. His cheery presence will be sadly missed.

Further appreciations will appear next week.

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Francis Shaw machine

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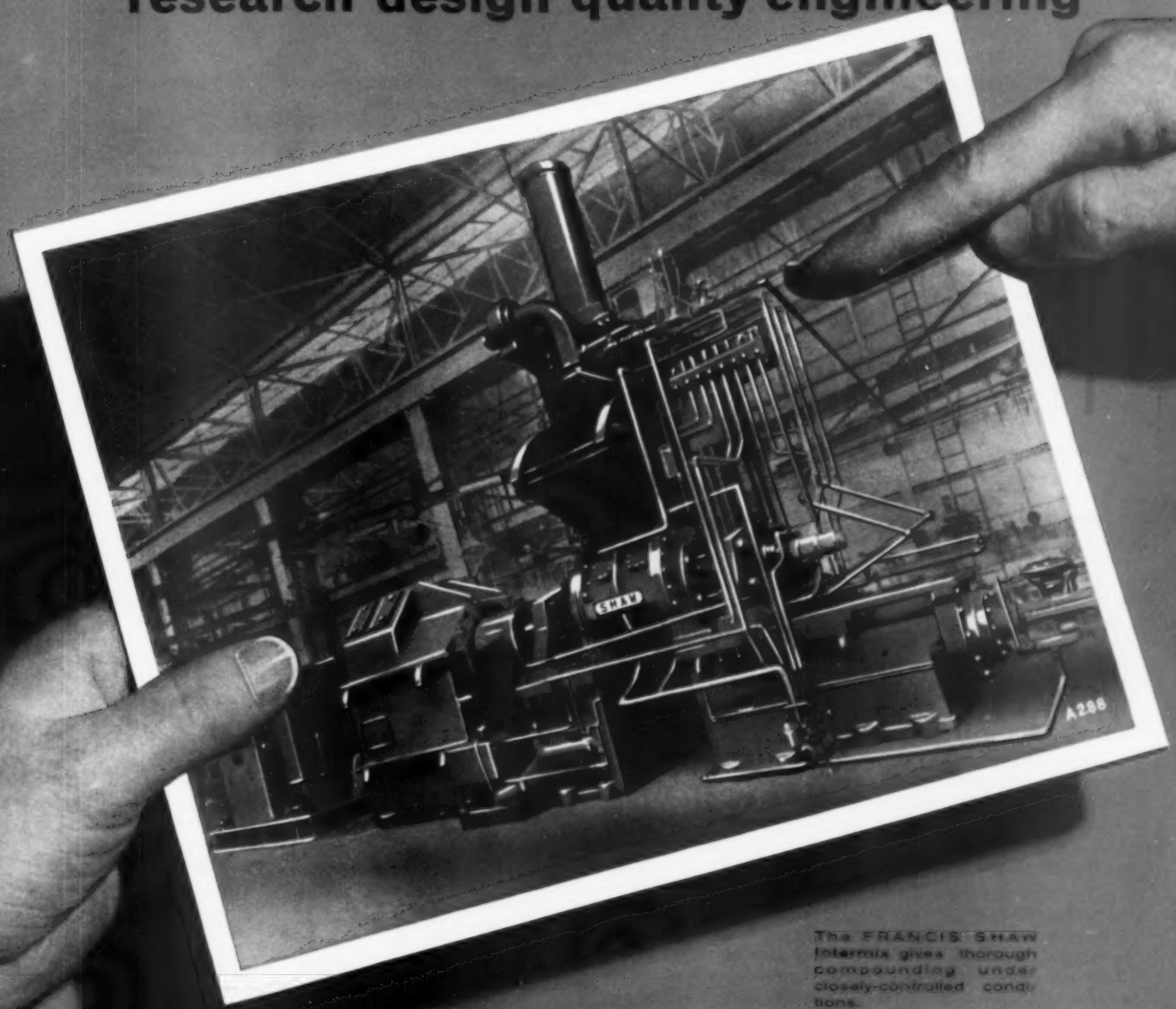

Constant research and development, close co-operation with users, advanced design, selected high quality materials... These, coupled with long experience, help to create processing machinery of unrivalled performance.

The FRANCIS SHAW Intermix gives thorough compounding under closely-controlled conditions.

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OVERSEAS AGENTS THROUGHOUT THE WORLD

P4377

VIEWS and REVIEWS

Superficial Chemistry

OR, is it physics? The two get less and less distinguishable.

Much of the technology in our group of industries is superficial in the sense that it is concerned with what goes on at surfaces. A paper entitled 'Investigation of the Wettability of a Solid Surface by a Polymer' has recently been issued by RAPRA as one of its excellent translations from the Russian.

The RAPRA abstract reads: 'By investigating the wetting of various solid surfaces by polymers it is shown that the nature of the interaction of low-molecular materials and that of polymers is completely different. Furthermore, the conceptions of hydrophilicity and hydrophobicity are inadequate for assessing the wetting of solid substances by polymers'.

The paper (Translation No. 903) will be of particular interest to compounders and polymerizers.

In wetting a compounding ingredient, the structure of a polymer cannot remain unaltered; large, globular macromolecules must unfold in order to pack closely on to the surface of the powder. Because the energy of wetting of a high polymer must be of the same order as that of a low-molecular liquid, it follows that the free energy of wetting by a high-polymer must be less than by a low-polymer since a part of the energy is consumed in altering the configuration of the high polymer.

Electron Microscope Studies of Wetting

To investigate this matter, the authors carried out work using an electron microscope magnifying 10,000 x on specimens prepared by mixing a solution of a polymer with colloidal dispersions of various substances.

They began by showing that crystals of aluminium hydroxide are not wetted by either the globular polyacrylic acid or the very different fibrils of sodium polyacrylate.

They then studied the interaction of carbon black and polyisobutylene, and found that there was no wetting of thermal black by pib, because, they thought, of the presence of oxygen-containing groups on the surface of the black. This was supported by the evident wetting by pib of the surface of a carbon black specially prepared with a clean surface by means of the 'voltaic arc', though this special black was not wetted by isotactic polystyrene.

The work was continued by a study of the degree of wetting by various types of polystyrene of the surface of particles of a chrome catalyst. Electron microscope pictures clearly showed that atactic polystyrene readily wetted the chrome and so does isotactic polystyrene when it has oval-shaped particles but not when its particles are fibrillar.

Latex Foam Stability

More surface chemistry is dealt with (and I am inclined to think it is more superficial) in another RAPRA Russian translation (No. 905) which concerns the characteristics and properties of air-foams made from polychloroprene and butadiene styrene latices.

The Russian authors think that 'in spite of the wide practical use of latex foams, there has been little investigation of their properties or colloidal systems and of the influence of various parameters of the original latex upon these properties'. If they forgot to add 'in Russia', I might agree with them; I would also agree if, instead of 'investigation', they meant 'publication'; but, the statement as it stands is not true. There have indeed, in both Europe and the US, been extensive and thorough investigations into these properties.

Less Than the Whole Story

Unfortunately, it will be difficult for Western technologists to comment usefully on these Russian results because of lack of vital information in the Russian paper.

It will be appreciated that the stability of these foams is governed by a number of factors, one of the most important being the content and nature of the foaming and de-foaming agents present. This information is lacking. In fact, it would seem that the experiments reported were carried out by mechanically foaming the 'pure', 'raw' latices, *i.e.* uncompounded and with neither foaming nor gelling agent added. If this be so, it is a little disingenuous for the authors to complain of lack of technical investigations in view of wide practical use. Before the latex could be put to any sort of practical use as a foam it would need the addition of compounding, foaming, and gelling agents, the addition of which would entirely transform the properties here reported.

For what they are worth, then, the results of this investigation appear to show the importance of latex viscosity in the determination of bubble-size-uniformity and the drainage stability of the foam.

Russian Polymer Literature

In addition to the translations of the kind I have just been dealing with, which they themselves publish in duplicated form, RAPRA also valuably serve the industry by translating, almost in their entirety, the Russian rubber journal (published by Maclaren and Sons Ltd. under the title, *Soviet Rubber Technology*) and the Russian plastics journal (published as *Soviet Plastics* by Rubber and Technical Press Ltd.).

I call this a valuable service because they are both items which nowadays must be included in the technical reading of English-speaking technologists and management in our industry. Consider the latest issues of each of them.

'Soviet Plastics'

The first issue of *Soviet Plastics*, which is a cover-to-cover translation of the Russian monthly, *Plasticheskie Massy*, has just been published. Apart from several pages of technical news items, it has a dozen or more original scientific or technological papers, arranged in six or seven classes, such as addition polymers, condensation polymers,

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

organosilicon products, processing methods, equipment and analysis.

One of the papers concerns some of the thermal properties of polypropylene (of which industrial production has already begun in the USSR) and especially the relationships between cooling rates and degree of crystallization.

Another records the results of research on the polymerizing of styrene, in the presence and absence of initiators, by ultrasonic vibrations.

A third, which is less a piece of original research than a what-next study of the literature — and none-the-less valuable for that — surveys the oxidative degradation of polyolefines and the action of inhibitors. It recommends further general studies in this field and of the special action of phenol derivatives with aliphatic substituents in the ring, of methylphenylsulphide and other sulphides together with phenol derivatives, and of the antioxidants of the alkylated arylphosphite class, which do not discolour clear materials.

Molecular Structures

A group of researchers has studied, by infra-red spectroscopy, the hardening of polyamides, and another group has studied, chiefly by gas chromatography, the thermal breakdown of hardened epoxy resins. Both have thrown light on the chemistry of resin condensation and molecular structure.

An excellent review article by K. A. Andrianov surveys the methods of synthesizing polymers having inorganic, main molecular chains, summarizing, in two apparently valuable tables, the results of hydrolyzing difunctional silicon-containing monomers, and of hydrolyzing and condensing trifunctional monomers. Special attention is given to cyclic compounds.

Processing Plastics

Increased cross-breaking strength of GRP is reported in a paper which gives the results of chemical pre-treatment of the glass fibres, particularly by silanes. The addition of such materials to the binder resin itself can, in some circumstances, bestow valuable properties, such as increased water-resistance and mechanical strength.

Three papers on processing methods include two on pvc (extruding tubing, and using epoxies as stabilizers) and one on the use of ground waste amino and phenolic plastics.

Among the other papers published in the June 1960 *Soviet Plastics*, the only one I have space to mention is the first of a series on the mechanical testing of plastics. 'Owing to the lack of textbooks and courses on the mechanics of polymers, the present article systematizes and clarifies the developments in this field which are of importance in using polymeric materials'.

It deals with the nature of elasticity in polymers, the temperature-deformation relationships which define the three physical states of polymers, 'forced' deformation, and the main mechanical characteristics of polymers. It is an excellent review for students.

Soviet Rubber Technology

The latest issue of *Soviet Rubber Technology* is just out and is a translation of the October 1960 issue of *Kauchuk i Rezina*. It has 11 technical papers and articles, among which I hesitate to select any one because they all have their points of recommendation.

A striking feature of them all is their obviously practical aim; they are patently intended to help forward the production of Soviet rubber goods and techniques. Even what is perhaps the most theoretical paper in this issue, V. O. Fogel's 'Study of the Temperature Distribution in the Vulcanization of Large Rubber Articles by Means of an Electrical Analogue' (the study, not the vulcanization, is by means of the analogue) is disarmingly simplified to a practical objective by pointing out that: 'Thermal conductivity, having as its basis Fourier's law of proportionality between rate of heat flow and the temperature gradient, may be modelled by various methods such as electrical analogues, hydraulic analogues, and diffusion analogues. However, electrical quantities can be more easily and exactly measured than other physical values. . . .' The paper gives details of the construction of the apparatus and its theoretical basis.

Practical Papers

At the other extreme are several accounts of production process development. They include: 'Transport of Carbon Black by a System of Pipelines', 'Automatic Removal of Curing Bags from Motor Cycle Tyres', 'Automation of the Preparatory Processes in the Making of Artificial Leather' and 'Formulation of Heat-Stable Rubbers for Insulating Cables on Continuous Vulcanizing Equipment' (sulphur-free mixes using TMTD and phenol-formaldehyde resins).

There is an article on 'Ways of Improving the Organization of Synthetic Rubber Works' which I could hope will be drawn to the attention of boards of directors in Western countries by the Technical Information Officers. It complains that only one in ten of the workers is engaged on research and that 'many engineering workers who are capable, as practice has shown, of solving technical problems, are deprived of the opportunity of creative activity'.

The managing director, the article contends, should control the activity of the entire factory, concentrate on problems of technical policy, and directly control the main research laboratory. The technical director is his first deputy and responsible for production. The commercial director handles the whole financial and economic activity, including supplies and sales.

There are technological articles on polybutadiene, on the thermal sensitizing of natural and synthetic latices, and on the design of rubber-testing apparatus.

Easy Reading

I have pointed out before that one advantage of reading articles in translation is that the translator helps by predigesting, clarifying, and organizing. Not the least recommendation for these two journals, therefore, is that they are easy to read and assimilate, the conclusions being readily found and clearly set out.

CHARLES JENNINGS

MEN *and* MATTERS

A Review of People and Events

MR Lloyd's speech on Tuesday means a hardening of the economic climate. In such times a strong trade association becomes more of a necessity than ever. The rubber industry is fortunate in its federation — and in the strong lead that it will certainly get from the federation's

new president, Maurice Baker, who took office on Thursday (July 27).

Mr Baker, a director of the Firestone Tyre and Rubber Co. Ltd., joined the company in 1928 as a member of the sales division, and since then has had an unusually wide business experience. In 1935 he became advertising manager; he moved to the production side in 1940; and since 1947, he has been chief purchasing agent, being appointed to the board in 1958.

The new president has always taken a lively interest in the affairs of the industry as a whole. He was a founder member of the industry's materials supply committee, of which he became chairman at the end of 1959. He was one of the prime movers in the world-wide campaign

by Peter Richards

for the more orderly and reliable marketing of natural rubber, and leader of the UK rubber industry's delegation to the Third International Rubber Quality and Packing Conference in Singapore last year. The remarkable success of this conference owed much to his initiative and hard work during the many months of preparation on both sides of the Atlantic.

Mr Baker is also an industry advisor to the Board of Trade's representatives on the International Rubber Study Group. He has been a vice-president of the FBRAM since 1959, and is one of the chief authors of the federation's handbook on 'Natural Rubber Grades and Contracts'.

Vice-presidents for 1961-62, who took office at the same time, are: D. E. Cameron, chairman and managing director of the B.B. Chemical Co. Ltd. and chairman of the Sealant Manufacturers' Conference of the FBRAM, and D. D. Marshall, managing director of the Greengate and Irwell Rubber Co. Ltd., and chairman of the British Rubber and Plastics Belting Manufacturers' Association.

This bundle of vinyl-coated nylon fabric will form an airhouse 180ft. long and 30ft. high when it is spread out and inflated. B. F. Goodrich is using it as a tyre warehouse in USA. A smaller, similar air house is being used at Old Trafford as a refreshment marquee during the fourth test. *(See: A Nylon House for VIPs . . . and for Tyres)*

A Nylon House for VIPs . . .

Polymer people on business at Old Trafford have found it impossible to escape from plastics. A refreshment marquee for VIPs at the fourth test match has been constructed from a nylon airhouse proofed with pvc. Made by Gourock, the house measures 70ft. x 40ft. x 20ft.

The pitch — which the last time the Australians were here was the villain of the piece — is, like the VIPs, protected by plastic. A sectioned cover, used by the Lancashire County Cricket Club to span the entire table at Old Trafford, is also made of nylon proofed with pvc.

. . . and for Tyres

Bigger versions of nylon airhouses can, of course, be produced. They may be used as temporary warehouses, mobile offices or canteens, emergency hospitals, portable exhibition halls and so on. At Hampton, Middlesex, recently, a house was built underneath one. In America, B. F. Goodrich is using two at Los Angeles as warehouses for tyres; they are said to cut storage costs by as much as 80% and provide space for 60,000 passenger tyres.

Each structure, containing 226,195 cu. ft. and measuring 180ft. long, 60ft. wide and 30ft. high, is shaped like a quonset hut with round ends. Both units were erected and ready for service in only two days.

The shelters may be in service at the present site for as long as seven years, but the minimum time for this first installation will be two years. Seventy tons of sand placed in a sleeve along the entire bottom edge of each air house provides ballast enabling the structure, with additional anchoring to the paved surface, to stand firm against gale force winds. The roof, with proper air inflation, will support a 1,000lb. weight suspended from the centre. Goodrich is considering the use of more houses at main tyre distribution centres.

The Leeches and Mud Test

Ever heard of the leeches and mud test for rubber boots? Six pairs worn by Oxford undergraduates will undergo this shortly when a university ex-

BEHIND THE DUNLOP SYMBOL

What does Dunlop sell? Tyres. That's true. But tyre valves, too... millions of them each year... the rubber lining for a complete reservoir... two hundred different kinds of rubber mouldings for the aircraft industry... basketball boots... disc brakes... conveyor belting... And these are only a few of the thousands of products marketed by Dunlop, in 1960 to the sum of £275 million. A record turnover, and the product of steady growth. The organisation behind the new Dunlop symbol is one of the most enterprising and progressive in the world.

DUNLOP SYMBOL OF PROGRESS

pedition leaves for the South Caspian.

The principal aim of the expedition is to investigate the migration of birds and insects through the passes of the Eastern Elburz Mountains. The exploration area consists largely of swampy forest regions and rice paddies and the boots — Clyde protective boots manufactured by BTR — will be necessary for protection against mud, water and leeches. The principal features of the boot are a cushion insole and arch support with heavy anti-scuff toe-cap, foxing and outsole.

Monsanto Plastics Appointments

G. V. Cox has been appointed general manager of sales, plastics products, of Monsanto Chemicals Ltd., and M. W. Waugh general manager of sales, chemical products. Both will be responsible to the director of sales, D. C. M. Salt.

Mr Cox, who joined Monsanto in 1951, will be responsible for sales of polythene and styrene plastics. Mr Waugh, who came to the company in 1947, will be responsible for sales of fine, heavy and technical chemicals.

G. H. W. Cullinan

G. H. W. Cullinan, deputy managing director, Shell Chemical Co. Ltd., will be giving up his executive duties at the end of July. But he will remain a director and will continue to represent the company on the council of the Association of British Chemical Manufacturers, and on various committees of the chemical industry and the Federation of British Industries.

Mr Cullinan joined Shell from Oxford in 1926, serving in the Middle East, and from 1936 to 1939 was manager of the company's affairs in Palestine, later returning to Cairo to become general sales manager for the whole area. In 1946 he returned to the UK to become general manager, Technical Products Ltd., and when this became Shell Chemical Co. in 1955 he was appointed commercial director and, later, deputy managing director.

Appointments in Brief

Thomas J. Milligan, assistant sales director of Du Pont's Electrochemicals Department, will become managing director of Du Pont de Nemours International S.A., on August 1. Mr Milligan succeeds William D. Eaton who has been promoted to assistant European director of the Du Pont Company's International Department. Mr Eaton will be responsible for the affairs of the European Division in Wilmington, USA, and will return there in August.

C. R. Porter will be joining Witco Chemical Co. Ltd. at Droitwich, as development manager of the latex division. He is an AIRI and has a very long experience in the foamed latex and textile fields. His activities will comprise both management of the latex compounding department as well as technical service.

* * *

N. Loring Bowen, Jun., has been elected Secretary-Treasurer of Scientific Design Co. Inc., international designers and builders of chemical plants. He was formerly in the Law Division of American Cyanamid.

* * *

P. E. (Peg) Groom, credit manager of the Ekco group, retires on Monday (July 31) after over 27 years' service. He will be succeeded by W. A. MacArthur.

* * *

T. L. Harvey has been appointed technical sales representative for James Halstead Ltd., covering North Wales and Shropshire.

Polly Ester Says...

'Non-woven fabric — it hasn't been made yet!'

THE LEGAL ANGLE

Sponges Old and New

By a Barrister

'Diphenyl ether is a relatively unreactive, ring-system substance, stable towards heat and oxygen. . . . The first results, chiefly about an interesting new cellular polymer, are reported by J. D. Doedens and H. P. Cordts. . . .'—RPW, May 27 1961.

Reports like this are constantly appearing in *RPW;* the polymer industry grows and flourishes and so do the categories of sponge, old and new.

Equally, the categories of human sponge are never closed — and the most notorious example is the borrower who does not repay.

We know, for example, of a director of a large plastics concern who lent £500 to a colleague, about a year ago. It was intended to give a temporary leg-up to his friend in trouble. Nothing was said about the time for repayment, but when six months had passed and nothing had been returned, the director politely requested his money back. He received an apologetic refusal.

The result? He sought his lawyer's advice. 'When are loans repayable?' he asked. 'And how long is it before I can enforce my rights? Alternatively, as I did not specify a time when the money was to be repaid, can my debtor give me my money back, entirely at his own convenience?'

'If a time is specified when a loan is granted in which repayment is to be made', the lawyer told him, 'then that is the time that must be adhered to. But if no time is specified, then there is an implied term in the contract of loan that repayment must be made on demand. This applies in the case of bank overdrafts, and any other sort of loan. So if you were good enough to lend your colleague £500, you are entitled to demand it all back — whenever you see fit'.

'I demanded it — but with no results. . . .'

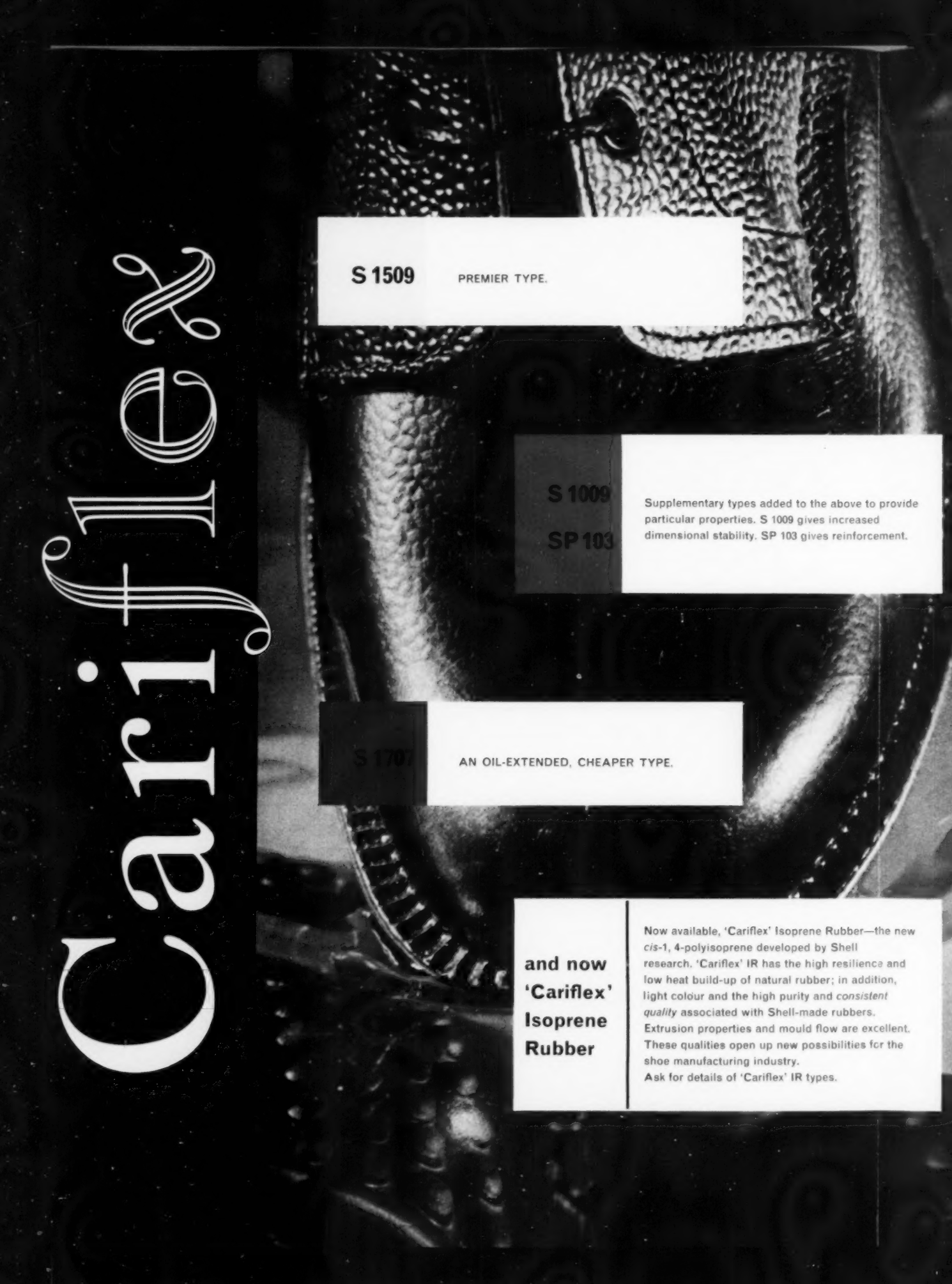
'Then you can sue for your money'.

'Suppose that I decide to be kind and give the fellow more time to pay, will I lose my rights?'

'Eventually — yes. The period of limitation is six years. In other words, you have six years from the date when the money became due within which to issue proceedings for its return. Alternatively, if you can obtain an admission in writing, signed by the debtor, then "time begins to run" once again from the date of that admission. So you can count your six years as starting all over again'.

The moral, then? There is a limit to the life of any sponge, human or otherwise — but if you wish to put an end to that life, you must not leave it to natural processes for too long. . . .

Carriflex


Cariflex
S 1509
PREMIER TYPE.
S 1009
SP 103
Supplementary types added to the above to provide particular properties. S 1009 gives increased dimensional stability. SP 103 gives reinforcement.
S 170
AN OIL-EXTENDED, CHEAPER TYPE.
and now 'Cariflex' Isoprene Rubber
Now available, 'Cariflex' Isoprene Rubber—the new *cis*-1, 4-polyisoprene developed by Shell research. 'Cariflex' IR has the high resilience and low heat build-up of natural rubber; in addition, light colour and the high purity and *consistent quality* associated with Shell-made rubbers. Extrusion properties and mould flow are excellent. These qualities open up new possibilities for the shoe manufacturing industry.
Ask for details of 'Cariflex' IR types.

what the D.V. process does . . .

As is well known, D.V.—the 'direct vulcanisation' or 'moulded on' process which has made a revolutionary impact on shoe manufacturing methods—involves moulding the uncured soling compound directly on to the upper and vulcanising *in situ*. Its use in the shoe industry is increasing rapidly, and it is, of course, highly suitable for mass production techniques.

ITS ADVANTAGES ARE . . .

short curing cycles—as little as 5 minutes for normal curing. No stitching or adhesives. Pelleted compounds may be used instead of uncured soling sheets—cutting and stamping can thus be eliminated, and the manufacturing process shortened. No welting required—and a reliable, waterproof bond ensured.

what 'Cariflex' does for the D.V. process

EXCELLENT MOULD FLOW—'Cariflex' accurately reproduces every intricacy of shape and pattern.

VERY LIGHT COLOUR—enables the whole range of footwear colours to be achieved; from translucent and light colours to dark browns and black.

FAST AND SAFE CURES—good scorch resistance makes fast cure times safe, minimises risk of rejects.

QUALITY—the range of 'Cariflex' types covers every level of shoe quality and price.

EXCELLENT PROCESSING—gives short mixing times, increases output.

GOOD ADHESION—adhesion problems are not normally experienced when using 'Cariflex' SBR and IR in these processes.

CONSISTENT QUALITY—'Cariflex' types do not vary in quality. Regularity and consistency of manufacture ensure compounds with regular processing and cure properties.

for all types of footwear

Sports shoes, plimsolls, slippers, casual and formal shoes, work and climbing boots.

for all types of soles

All types of compact and microcellular soles; sponge, transparent and translucent soling.

Shell Chemicals

Specimen formulations

DIRECT-MOULDED PLIMSOLL COMPOUND.

	Parts (wt.)
'Cariflex' S 1707.	85·0
'Cariflex' S 1009.	15·0
Zinc oxide.	4·0
Stearic acid.	2·0
Non-staining antioxidant.	0·5
Diethylene glycol.	1·0
Titanium dioxide.	17·5
Aluminium silicate.	37·5
Ground whiting.	75·0
Ultramarine	0·05
Coumarone resin (m.p. 80—90 C).	5·0
'Dutrex' 61.	12·5
Triethanolamine.	1·5
MBT.	1·0
TMTM.	0·6
Sulphur M.C.	2·25
	260·40
Specific gravity.	1·41
Cure, minutes @ 172·5 C.	2
Hardness, Shore A.	52

DIRECT-MOULDED SOFT SPONGE SLIPPER SOLE COMPOUND.

	Parts (wt.)
'Cariflex' S 1509.	100·0
Zinc oxide.	5·0
Stearic acid.	4·0
Non-staining antioxidant.	0·5
Diethylene glycol.	2·0
Hydrated silica.	20·0
Whiting.	90·0
Soft Clay.	20·0
Petrolatum.	30·0
Paraffin wax, (m.p. 52—54 C).	4·0
White factice.	5·0
Blowing agent.	4·0
MBTS.	0·9
MBT.	0·5
TMTD.	1·0
Sulphur M.C.	3·0
	289·9
Cure:	
Cavity 150 C Last 150 C.	8 minutes.
Cavity 150 C Last 100 C.	15 minutes.
Cavity 150 C Last 100 -70 C.	15-20 minutes.
Blow ratio 2:1.	

Shell's technical service

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An RPW Special Feature

Footwear

Three four-inch nails have been smashed through these polypropylene heels without cracking or splitting them. Made by Hollis Heels Ltd., Hull, from I.C.I.'s Propathene

and

Clothing

Interlining of Vilene non-woven fabric. Made by Bondina Ltd.; bonded with British Geon's nitrile latex

FOOTWEAR AND CLOTHING

The Impact of Polymers

DIFFERENT REACTIONS OF FOOTWEAR AND CLOTHING TO SYNTHETICS

THE impact of high polymers on footwear and clothing has been and continues to be revolutionary. Yet the attitude of the two industries to the incursion of this intruder into their traditional territories has been quite different.

In the clothing industry, man-made fibres, if not universally welcomed, were accepted with varying degrees of enthusiasm and have now been incorporated and absorbed with great advantage to that industry and its customers. The new synthetics are as much a part of the clothing scene as the old, basic fibres on which the industry was built: cotton, wool and silk.

The clothing industry, indeed, is still receptive to new materials, looks for them and encourages them, knows that if they are good they are bound to get there ultimately, and is determined to come to terms with them and to profit from them.

Footwear Resists the Tide

On the other hand, the footwear industry — generally, there were individual exceptions — attempted to resist the incoming tide. But now the wall is breached and polymers are flooding in.

It was but a year or two ago that buying a new pair of shoes with a rubber or rubber-resin sole required courage, persistence, and the expenditure, between one shop and another, of much shoe leather. Now, the pendulum is swinging the other way.

Irrational Slogans

Despite the clearly demonstrable fact that a good rubber or plastics sole wore many times longer and was much safer on wet pavements and dry grass than the best leather, its adoption was delayed, first by the repetition of irrational slogans and then by warnings of supposed foot dangers. Now, however, the trend has been completely reversed. In retail selling, plastics are a gimmick; in production, the figures for just one section of the trade speak for themselves: the UK production of men's footwear with leather uppers and vulcanized rubber soles for the first quarter of 1961 was 31.7% higher (at 1,622,928 pairs) than for the same quarter of the previous year. (For other statistics, see Fig. 4.)

Processing Uniformity

There are several reasons for this situation; and one of them is now being discovered by the footwear industry itself. It was expressed by H. Bradley, director of the Shoe Trades Research Association, speaking recently at an 'open day' of the British Leather Manufacturers Research Association.

He said: 'Leather's main problem is the variability of its raw material and the variability of its raw material price. The next supreme problem is how to cope with the great handicap of leather's variability. The trouble with this variation is that when any cut part of leather is used it always has to carry on its back the cost of a portion of the hide which is either down-graded or thrown away'.

He pleaded for new materials and especially man-made materials because of their reliability and uniformity which permit the streamlining of factory processes and are therefore more economical.

The polymer industry is providing these materials.

Soling

For soling materials, natural rubber mixes were among the early developments and still are used; they were followed by SBR and then by high-styrene-butadiene copolymers (Fig. 1). Microcellular and translucent soles are now usually based on SBR; the oil-extended types, being cheap, are now widely used in many kinds of rubber soling.

Microcellular rubber is a development from 'blown' rubber sponge. A nitrogen-evolving 'blowing' agent is incorporated in the mix, but expansion is not allowed to take place until the release of pressure when the sole is removed from the mould. The tiny bubbles so produced are closed and therefore the material, though cellular, does not absorb water.

Fashion Features

Translucent soling and some of the quite attractive coloured soling now available as fashion features owe their existence to the development of light-resistant polymers, curing by peroxides instead of sulphur, and the introduction of white or almost colourless compounding ingredients such as silica.

Specialized synthetics and blends are being evaluated on a large scale but, most of them being more expensive, are confined to usages where their special properties are required. Nitrile rubbers are useful, for instance, where particular resistance to abrasion, oil and chemicals is desired. They are often used in combination

Fig. 1. Cutting pairs of Pennine resin rubber soles based on I.C.I.'s Butakon S butadiene styrene copolymer (high styrene) at Morris Rubber Industries Ltd., Byfleet, Surrey

with SBR, and recently have been tried with pvc. Claims are being made for Hypalon as a soling material, the high cost of which might be offset by its much better wearing properties and greater length of life. For heels, it is said to last as long as the shoe — a large claim indeed.

Development in SBR and other synthetics are treated in more detail in the article on page 171.

Moulding

A traditional process in the rubber and plastics industry is moulding by heat and pressure, and it is therefore natural that the use of rubber and plastics for footwear should give birth to the idea not only of making complete shoes from them, but of making them in one moulding operation. Partial moulding, for example, moulding soles on to fabricated uppers is well-known and is widely employed in the footwear industry in a variety of ways, but recently single-moulding has gone a long way too, and may be predicted to be going much further.

In the US, the International Shoe Corp. has made all-vinyl footwear, by moulding, which outwears leather, it is claimed, by ten to one, but which costs less than half as much. The sole, heel and side vamps are injection-moulded in one piece, and the hollow heel is afterwards reinforced by inserting a special plug.

Another method is to use one or more liquid plastisols of pvc in a suitable mould and, by heating, cause gelling to produce the 'solid' boot or shoe. Similar processes are possible using rubber or plastics latices, some of which can be subsequently heat-vulcanized.

The attractiveness of clear colours has recently caused a revival of interest in pvc shoes and shoe soles produced by these methods. Properly plasticized, the pvc becomes much better-wearing and resistant to slip than when hard — defects noted in pvc soles immediately after the war when rubber was in short supply.

Uppers and Other Components

PVC is also under development from a new angle — uppers are made from laminated sheet material made by combining knitted fabrics, 'solid', and cellular pvc, which can have all the feel and appearance of first-class side-leathers.

A so-called 'sueded' pvc is also available now in which an attractive surface is obtained by tiny indentations produced by pressing into it a water-soluble powder (such as common salt) which is subsequently dissolved away by washing with water.

Fig. 2. Ambla, an expanded pvc fabric made by I.C.I. (Hyde) Ltd., is used here for fashion wear, coats, hats and shoes, handbags and purses and even a pyjama case

Resin finishes for leather are now quite common, the latest being a polyurethane treatment which firms up the grain and reduces piping and the effects of scuffing. This is making possible the satisfactory use of poorer, cheaper skins.

A related polyurethane process produces an excellent 'patent' leather having all the customary good gloss but being much more resistant to cracking than conventional 'patent' because it is more elastic. Leather splits are also being coated with pvc to make a cheap 'patent'.

The stiletto heel raised a number of awkward problems for the technologist. One, concentrated abrasive wear, was met by using polyurethane.

Insoles, stiffeners, toe puffs, and bottom units in plastics are now raising interesting possibilities. Plastics heel bases for men's shoes are now in wide use.

Joining: Threads and Adhesives

In footwear, sewing threads of nylon and Terylene are beginning to find favour because of their strength, resistance to flexing and to rotting, and even their price. 'Bulked' or 'textured' nylon threads have a special interest because of their softness, wax pick-up and needle-hole filling.

Whether for plastics, rubber or leather, adhesives are another important contribution of the polymer industry to footwear. One of the most versatile and most widely used is a neoprene, general purpose cement. Neoprene adhesives are also under development for the specially difficult problems such as are met when working with translucent rubber or pvc soles, and particularly when adhesion to pvc uppers is required. Paired cements, nitrile rubber and neoprene, are receiving attention.

Imitations

It must not be supposed that in order to meet a need, the first material chosen will always remain the best for that purpose. If that were so, the clothing industry today would consist of dyers, foresters, and furriers, providing respectively woad, fig-leaves, or animal skins according to the climate, tastes, and pockets of the country.

Historically, development often started by trying to imitate the old material and ended by discovering a new material with properties which fitted the purpose even better. This process can often be seen at work in the development of synthetics for clothing and footwear.

One of the most striking, and altogether admirable, imitations is leathercloth, the plastics-coated fabric aimed at reproducing the appearance, drape, handle and properties of the best quality shoe and clothing leather. The most modern leathercloths as made by craftsmen-producers like Bernard Wardle and Co. and I.C.I. (Hyde) Ltd. are a revelation (someone should invent a word for them as good and attractive as the material itself).

The main recent advance in these materials is the use of a microcellular pvc for the coating. This structure is produced by incorporating a blowing agent and, to give added abrasion resistance, is itself coated with a non-

cellular pvc. With the right fabric base, the resulting leathercloth is supple, hard-wearing, easily wiped clean, and can be produced in a wide variety of appealing colours. As the illustrations in this article show, it is finding its way into attractive garments and fashion accessories (Figs. 2 and 3).

Non-Woven Fabrics

The polymer industry is going even further in imitating leather than making a coated fabric. A real match for leather is coming from a sector of a much wider development destined to have a marked influence on both footwear and clothing — the production of fabrics without weaving or knitting. They are made by bonding textile fibres with a suitable latex.

For instance, a 70 : 30 nylon-rayon mixture can be impregnated with a Hycar acrylonitrile latex at about 2½oz. per sq. yd., dried and rapidly cured, to give a strong fabric which will withstand 450 hours exposure to a UV light source without discolouring.

At present used for dress interlinings (see illustration on page 167), suit paddings, and in its stiffer forms as waist slips, non-woven fabrics when further developed have an exciting future.

Some kinds are real artificial leathers, that is they are interlaced, felted, fibre networks, strongly bonded, resistant to water but permeable to water vapour, and can be worked like leather on shoe lasts. Like leather, too, they can be compressed without creasing or pleating.

Foambacks

The materials which are causing the greatest excitement in the clothing industry are, of course, foambacks. They are combinations of textile fabrics with thin sheets of polyurethane foam.

For the past 12 months, the clothing trade has chattered of little else. It is certainly approved widely, and sometimes in the most extreme terms, of which 'revolutionary' is one of the mildest.

There is no doubt that foambacking does a good deal for fabrics. Technically speaking, its most important effect is that it much improves their heat-insulating properties, and, as it is very light in weight, being a foam, it can make cloth for 'warm' garments, such as overcoats, much lighter in weight than we have been used to. That is its main effect — to turn a 'light' cloth into a 'heavy' one with only the slightest addition to the weight.

The foam has other interesting and useful effects, too, particularly in drape and handle. It is elastic and therefore a good crease-resister. A group of Scottish clothing manufacturers interested in tartan and tweed foambacks sees a great future for the new development and stresses that foamback tweed coats can be packed in luggage for days and come out creaseless.

So far, two technical problems have prevented its earlier development: securing a satisfactory adhesion between a $\frac{1}{16}$in. thick, flimsy sheet of polyurethane foam and a light fabric, and ensuring safe dry-cleaning. Both have now been overcome. An article on foambacks in this issue, on page 176, details a suitable adhesive system.

Two main combining processes are available. One is to use an adhesive, the other is to heat the foam and thus lightly melt the surface whereby it becomes it own adhesive, and press it on to the fabric. There is at present much discussion as to how far by these processes the porosity of the foam is or should be retained.

Big Business Ahead

Whether it ultimately turns out to be merely a passing craze or to have more lasting results, it has already had drastic effects on companies in both the textile and plastics industries.

In the clothing industry, for instance, the Medlock Manufacturing Co. is working on a large scale on fabrics specially designed for foambacks which are being combined for them by the Calico Printers Association. By this summer, they were expecting to be up to 10,000yd. a week.

In the plastics industry, Kay Bros., which has been making 'Foamoprene' for several years, has taken foambacks so seriously as to send its sales and technical directors on an extensive tour of Europe and America to study foamback potentialities and techniques. Lintafoam Ltd., a company which has specialized for many years on combinings of fabrics and foams, has made a special effort in this new field and come up with new ideas and methods which they claim retain the foam porosity and yield products resistant to dry cleaning. Very recently, Lintafoam signed an agreement with the US company Reeves Bros. (Inc.), producers of Curon foam (*RPW* July 22, 120). A new company is being set up and know-how is being exchanged.

It seems that, for foambacks, the polyester-based urethane foam is preferred to the newer polyether-based foams which are more elastic and better suited perhaps for upholstery cushioning. Knitted fabrics are said to be the best for foambacks but this is by no means universally agreed and time may change the view; it is certainly likely that the fabrics will be designed specially for the jobs they have to do.

Continued on page 187

Fig. 3. Teenager coats made from Bernard Wardle's Everflex, based on microcellular pvc leathercloth using British Geon resin

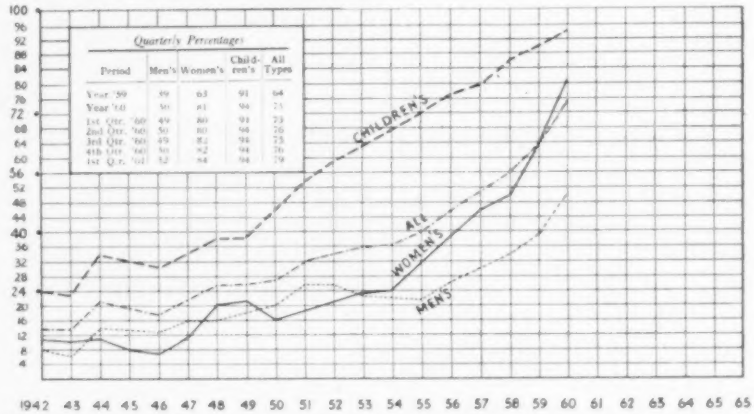

Fig. 4. UK production of footwear with uppers wholly or mainly of leather, showing percentage with non-leather soles — *Source: Footwear Manufacturers' Journal*

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softer
cooler
more comfortable

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This major breakthrough in soling technique owes its existence to the special qualities of the raw material used—Polysar* SS250 Flake—and its practical application is made possible by the successful design of the unique high pressure moulding machine, Mark IV, designed and developed by C.I.C. Engineering Limited. Together they have resulted in a manufacturing process capable of producing microcellular soling which is lighter, softer and more flexible than ever before . . . because it has the hard-wearing qualities of a nuclear sole!

*Trade Mark Reg'd.

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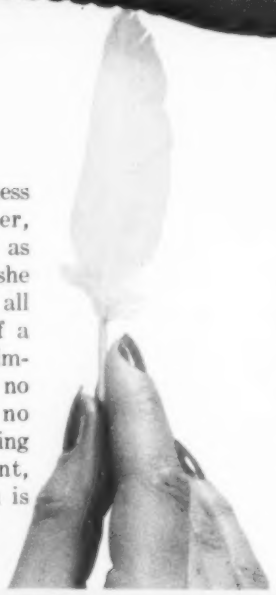

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FOOTWEAR AND CLOTHING

SBR Steps Ahead

UK NOW WALKING ON 30,000 TONS OF SBR A YEAR

By J. WALKER
Polymer (UK) Ltd.

THE importance of rubber in the footwear industry is illustrated by the fact that some 90,000 tons of rubber, mostly synthetic, are used annually in the USA footwear industry, and about 30,000 tons in the UK industry.

Synthetic rubbers are now used in all types of shoe products, including resin rubber soling, microcellular soling, sponge, oil-resistant footwear, transparent and translucent soling, as well as a wide range of moulded-on footwear. In addition to this, synthetic rubbers are used widely in adhesive applications, and in foam rubber products for insoles and so on.

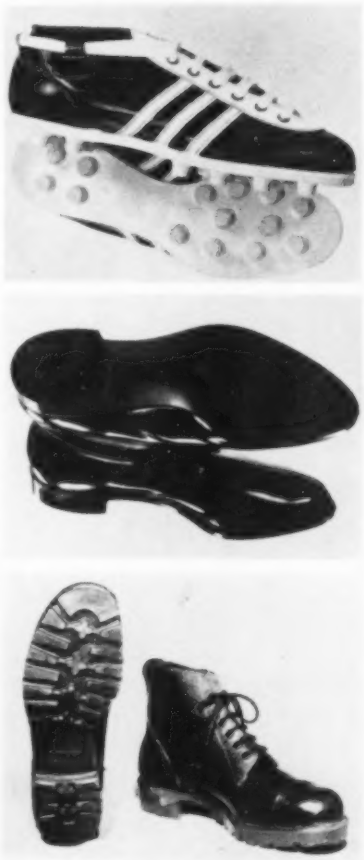
If one traces the development of the use of synthetic rubber in the footwear industry, it can be seen that in the immediate post-war years, while standard rubber soles and heels met a limited demand, leather was the traditional material, apart from sole crepe, which was used widely for children's sandals and other types of shoes.

Man-Made Soling

The first introduction of truly man-made soling materials came about just after the war. The Crown-owned Canadian company, The Polymer Corporation, introduced the now well-known Polysar SS-250 to the UK in 1947. The introduction of this and other similar materials enabled the British rubber industry to develop resin rubber soles for the British footwear industry, and for the first time the shoe industry had an alternative material to leather. This new material, having low specific gravity, high hardness, high abrasion resistance, good flex life and a degree of stiffness similar to leather, was received very favourably by the footwear manufacturers, but it required several years of promotion by the rubber manufacturers to persuade the shoe industry that this new development was not in any way harmful to foot health.

Following this early introduction of man-made raw material, a number of other factors influenced the growth and the use of synthetic rubbers in footwear applications:

1. Continued research by synthetic rubber producers resulted in the introduction of a wide range of polymers that were of considerable help to the industry, due to their unique characteristics for specific applications and their improvements in processing, so enabling the rubber industry to produce a wide range of shoe products for sale to the footwear trade.
2. The fluctuations in the prices of natural rubber led manufacturers to consider more and more the benefits of the price-stable synthetic.
3. The variation in characteristics of soling leather and the rising prices in the leather market.
4. The introduction of moulded-on machinery and equipment.



(Top to bottom) **Pass-Master football boots by Barretts and Speed-Along Italian style town shoe by George Webb, both with direct moulded soles of Avon Nuberlite resin rubber; Dunlop industrial boots with oil-resistant nitrile rubber soles**

Coincidental with these developments, the chemical industry was also busy in introducing new types of fillers, accelerators and antioxidants, which again increased the range of products developed by the rubber industry.

Oil Extended Types

At first straight cold SBR was the principal type used in the manufacture of resin rubber soling, but subsequent development of improved non-staining oil-extended rubbers, and the more recent introduction of the low Mooney version of both cold and oil-extended rubbers has expanded the range of SBR's used.

Non-staining low Mooney cold rubbers have been received very favourably by manufacturers, because of the following characteristics:

1. Elimination or substantial reduction of peptizer or peptization times, which introduces savings in the overall mixing time.
2. The faster incorporation of fillers and the lower heat build-up encountered in mixing, resulting in safer processing.
3. Greater and more uniform expansion of both open-cell and closed-cell soling, which can result in the reduction of blowing agent in the compound.
4. Faster extrusion rates and easier calendering.
5. Better mould flow, which is of particular importance in moulded-on footwear.

Typical applications for the use of low Mooney SBRs are hard resin rubber soling (Table 1) and hard semi-expanded soling. The demand in the shoe industry for stiffer and harder soling products has presented the rubber manufacturer with a severe processing problem. The adoption of the low Mooney SBRs in such compounds has enabled manufacturers to carry out efficient mixing, and to obtain good calendering and good mould flow.

A typical application for these

rubbers is in hard microcellular soling, which has been used successfully in the footwear industry. More recently there has been a demand for a hard cellular soling in which larger pores are scattered randomly throughout the vulcanizate. This soling is very often split and buffed, and has the appearance of a 'sueded leather'. A suitable compound for this application is given in Table 2.

Pore Size Control

The pore size and density of cellular soling can be adjusted by varying the amount of blowing agent, the compound viscosity and cure rate, and the hydraulic pressure applied to the mould.

To obtain the pore structure and density desired for hard, sueded cellular soling, pressure on the mould must be kept low to allow for expansion of the cells, but not so low as to allow the gases to escape. If the mould pressure used is above the critical pressure for a given compound, small pore size and high density will result. A pressure of about 350psi was satisfactory for the compound quoted, but the critical pressure will be somewhat different for other formulations.

A constant pressure throughout the cure will give the desired result, but many manufacturers use an initial high pressure in order to improve the flow of the compound, and reduce the incidence of blisters. The initial high pressure is reduced after about two or three min., depending on the cure rate of the compound, in order to obtain the desired cell structure. The timing of the pressure reduction is critical; the gases will escape and a high density and poor cell structure will result if pressure is reduced before the proper state of cure and blow has been achieved. Conversely, if a high pressure is maintained for too long a time, the compound will not blow sufficiently, and small pore size will result.

Moulded-on Soling

In addition to the tremendous growth in the use of synthetic rubbers for the production of resin rubber and microcellular rubber, the developments in the technology of direct moulded footwear over the last ten years have resulted in no less than 15m. pairs of shoes and boots being produced by this process annually in the UK.

The recent development of moulded-on microcellular soles has resulted in considerable interest by the shoe trade, and a number of firms have installed suitable machines supplied either by BUSM Co. Ltd., or CIC Engineering Ltd. It is to the credit of British engineers and technologists who developed such a technique that the British shoe industry is able to offer, both at home and abroad, shoes styled with moulded-on microcellular soling, which offer tremendous sales potential because of the unique characteristics offered.

The development of microcellular direct moulded footwear has been made possible by applying the principle that the expansion of the sole shall occur in one direction only, and at right-angles to the sole. This is done by allowing the piston sole mould to drop during the curing cycle, so allowing expansion to take place. The balance between the rate of drop on the sole mould with the rate of cure and the amount and type of blowing agent in the compound requires considerable skill on the part of the technologist. Here, again, advantage has been taken of the easier processing characteristics of the low Mooney cold rubbers, and also the cross-linked polymers which enable good dimensional stability to be obtained on the blanks prior to moulding.

TABLE 1

Polysar rubbers	as shown	Solka floc BW200	5				
Cumar MH2½	8	Paraffin wax	1				
Zinc oxide	5	Diethylene glycol	2				
Stearic acid	1	Triethanolamine	1				
AgeRite Stalite	1	Spider brand sulphur	2.5				
HiSil 233	50	Altax	1.5				
Dixie clay	15	Methyl tuads	0.3				
Compound No. 15-S-		1,033	1,034	1,035	1,048	1,049	1,050
Polysar Krylene 602		26.7	55	67	—	—	—
Polysar Krynol 652		—	—	—	26.7	55	67
Polysar Kryflex 252		73.3	—	—	83.3	—	—
Polysar SS-250		—	45	—	—	45	—
Polysar SS-260		—	—	33	—	—	33
Specific gravity (vulc.)		1.27	1.28	1.27	1.27	1.27	1.26
Mixing							
Maximum mixing temperature (°F.)		280	265	265	250	245	270
Maximum power demand (kW.)		11.6	12.0	11.0	11.2	10.8	11.0
Compound properties							
Compound viscosity (ML-4 at 212°F.)		78	70	66	77	75	73
Unaged vulcanizate properties	Cure time (min. at 307°F.)						
Hardness, Shore A_2	10	92	91	92	91	88	89
	20	91	92	92	91	92	91
	40	92	90	92	92	91	92
Hardness, Shore D	10	37	36	38	35	34	34
	20	36	38	36	35	34	35
	40	37	36	38	36	34	35
Modulus at 100% elong. (psi)	10	630	700	725	580	550	550
	20	620	700	690	595	560	580
	40	670	660	700	580	570	590
Modulus at 300% elong. (psi)	10	1,210	1,300	1,320	1,240	1,060	1,050
	20	1,320	1,325	1,180	1,225	1,150	1,100
	40	1,320	1,300	1,290	1,200	1,140	1,090
Tensile strength (psi)	10	2,040	2,150	2,125	2,290	2,060	2,050
	20	2,080	2,180	1,960	2,160	2,040	2,000
	40	2,220	2,200	2,075	2,090	1,980	1,835
Elongation at break (%)	10	450	450	430	470	450	400
	20	430	440	450	450	450	470
Elongation at break (%)	40	450	440	450	460	450	440
Tear strength (lb. in.)	10	280	310	310	270	250	250
	20	280	300	300	270	260	250
	40	290	310	290	260	260	260

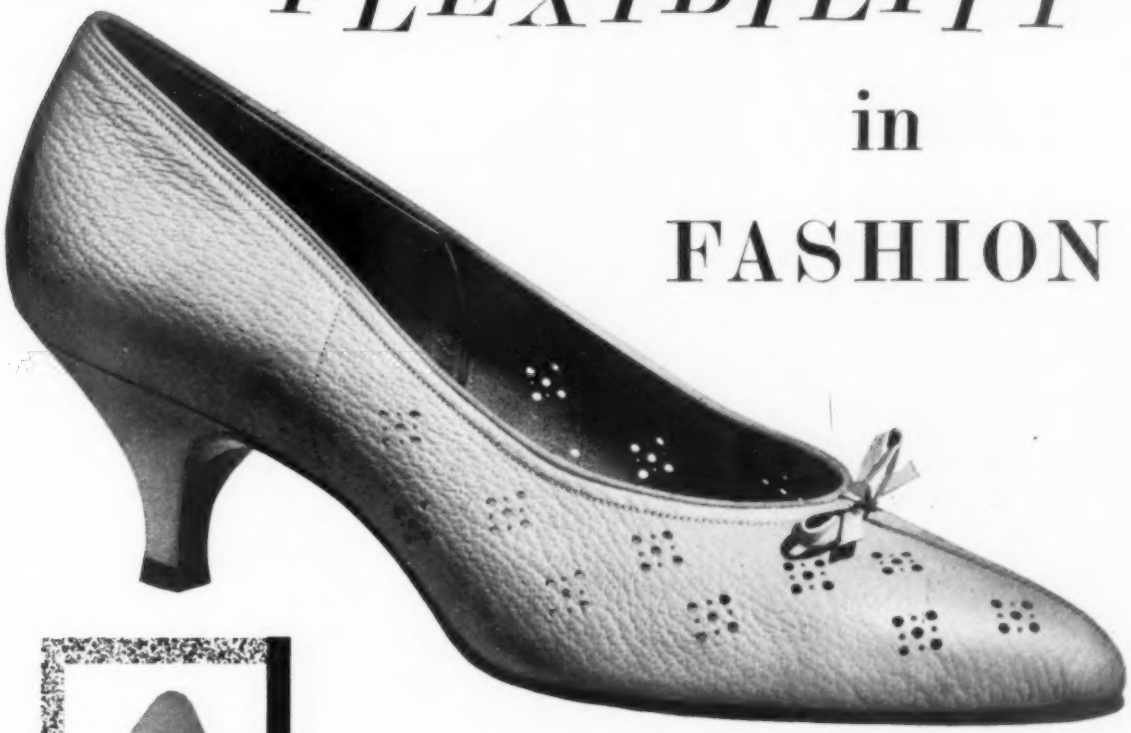
TABLE 2

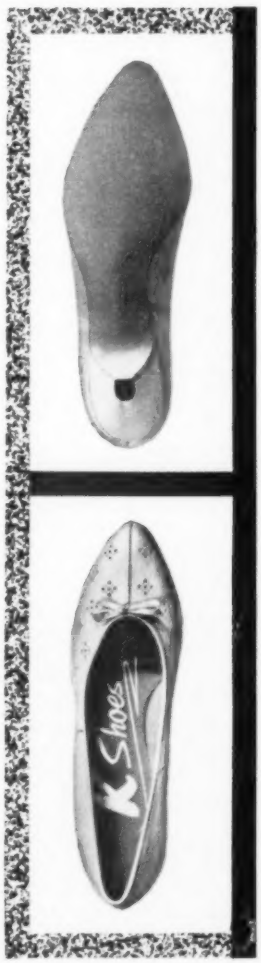
Polysar Krylene 602	40.0
Polysar SS-250	60.0
Cumar MH2½	10.0
Zinc oxide	5.0
Stearic acid	3.0
Nonox WSP	1.0
Manosil VN3	30.0
Zeolex 23	60.0
Solka floc BW40	5.0
Sunproof wax	2.0
Circosol 2XH	20.0
Diethylene glycol	2.0
Triethanolamine	1.0
Spider brand sulphur	3.0
MBTS	1.25
TMS	0.4
Celogen AZ	4.0
	247.65

Cross-Linked Rubbers

The use of cross-linked rubbers in the footwear industry is now well established. These cross-linked polymers, when blended with either SBR, nitrile or natural, improve the calendering, extrusion, surface finish and shape retention of the rubber article. Because of these characteristics, they are frequently used in microcellular compounds to improve calendering, with the production of a more accurate gauge. They are also very widely used in moulded-on compounds in order to obtain satisfactory extruded blanks which are dimensionally accur-

FLEXIBILITY in FASHION





For their Juliette range

K Shoes have chosen

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rubber soling of super quality material
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ate prior to cutting to length for the moulded-on process.

Cross-linked rubbers are also widely used in the manufacture of air-cured footwear, particularly for foxing compounds, in order to obtain good dimensional stability of the compound and to retain the pattern from the embossing calender during the hot-air cure.

Low Mooney Oil-Extended SBR

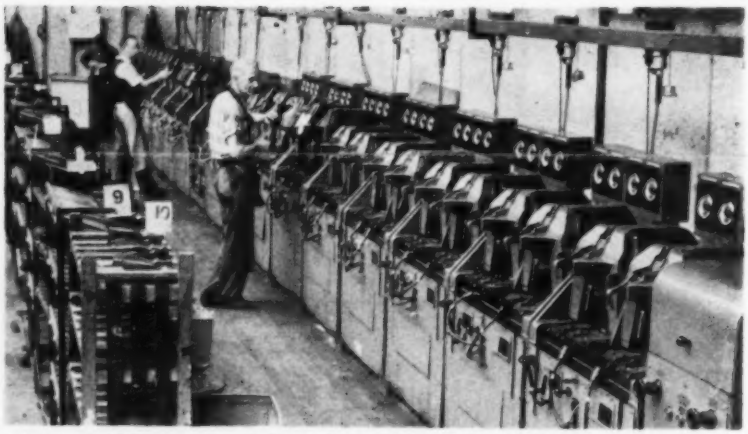
Following the wide acceptance in the tyre industry of oil-extended rubbers, the footwear industry has now taken advantage of the low cost of oil-extended polymers for use in compounds both for DV moulding and for regular resin and microcellular rubber. Initially neither the colour nor the processing of oil-extended rubbers were of a satisfactory standard compared to straight cold rubber. Both processing characteristics and colour of oil-extended rubbers have now been so improved as to make them extremely attractive for use in a wide range of compounds and applications.

In order to improve the processing characteristics and meet the demands of the rubber industry for easier processing, mixing and better mould flow, Polymer Corporation were the first company to introduce a low Mooney, non-staining, oil-extended rubber, Polysar Krynol 654. This polymer requires no breakdown to mixing, and its easy processing characteristics ensure rapid incorporation of fillers even when very heavily loaded. The advantages of using this type of polymer over regular oil-extended rubber are that it will offer a lower compound viscosity, easier processing, more rapid mixing with slightly greater processing safety and better moulding.

Oil-Resistant Footwear

It is only in the course of the last few years that the shoe industry has realized the improvements which could result in the use of nitrile rubbers as a soling material for industrial boots and shoes.

In many industrial boot applications, the soles are subject to extremely high abrasion, oil contamination and, quite often, severe heat ageing. Because of their extremely high degree of oil-resistance, abrasion and heat-resistance, nitrile rubbers have been adopted most successfully, both for regular oil-resistant soles and heels, and also for use in oil-resistant moulded-on footwear. In quite a number of countries the armed services have specified the use of nitrile rubber soling for service footwear, in order to obviate the hazards of more



A bank of high-pressure vulcanizing machines manufactured by the British United Shoe Machinery Co. Ltd. being used for the direct moulding of shoe soles

wear due to oil contamination, and also it has been proved that soles based on oil-resistant nitrile rubbers have most excellent abrasion resistance.

Butadiene Acrylonitrile Rubbers

A recently-developed nitrile rubber of interest to the footwear trade is Polysar Krynac 804. This is a terpolymer of butadiene acrylonitrile and divinyl benzene. Substitution of Krynac 804 for part of the elastomer in nitrile compounds reduces 'nerve' and shrinkage, and improves calendering and extrusion properties of the compound.

A moulded-on oil-resistant soling based on a 25/75 blend of 804/803 is shown in Table 3. These rubbers were chosen for the application because of the following advantages they offer:

(a) The medium acrylonitrile content of both the polymers assures excellent vulcanizate oil resistance.
(b) The presence of Krynac 804 reduces compound 'nerve' and shrinkage.
(c) Krynac compounds have outstanding abrasion resistance.

Blends of Krynac 804, Krynac 803 and pvc, can be used in the recipe given in Table 4, to have all the advantages of the previous recipe, plus marginally better oil-resistance, mould flow and abrasion resistance, along with increased hardness, modulus and tensile strength values.

Because of the pvc content, a cement was used to ensure adequate adhesion between the sole and the leather upper.

The cement was based on Krynac 801/Durez Resin 12687, as follows:

Polysar Krynac 801	100gm.
Durez Resin 12687	100gm.
Acetone	300gm.
Methyl ethyl ketone	300gm.

The cement was mixed in a paint vibrator after the polymer had been cut into small pieces to facilitate the dissolving in the solvents.

One coat of the cement was applied to the buffed rubber-leather contact area by brush, and allowed to dry for two hours. The Krynac/pvc-based stock was cured for 10min. at 320°F. The adhesion between leather and the rubber sole was tested at the toe area with the SATRA adhesion tester which gave a reading of 100lb.

Synthetic Latex

Synthetic rubber latex is of considerable interest in the shoe manufacturing industry for: fabric doub-

TABLE 3

Polysar Krynac 803-NS	75.0
Polysar Krynac 804	25.0
HiSil 233	25.0
Zeolex 23	35.0
Cumar MH2½	15.0
Triethanolamine	3.0
Dioctyl phthalate	25.0
Solka floc BW200	15.0
Spider brand sulphur	2.0
Zinc oxide	5.0
Stearic acid	2.0
Naugawhite	1.5
Black	1.0
MBTS	1.0
TMS	1.0
	231.5

Compound viscosity (ML4 at 212°F.)	36
Mooney scorch (min. at 212°F.)	12
Specific gravity	1.22

Unaged vulcanizate properties

	Cure time (min. at 330°F.)	
Hardness, Shore A_2 (inst.)	2	67
	5	69
	10	70
Modulus at 100% elong.	2	300
	5	320
	10	370
Modulus at 300% elong.	2	560
	5	640
	10	730
Tensile strength (psi)	2	1,120
	5	1,100
	10	1,170
Elongation at break	2	490
	5	430
	10	410

ling adhesives; shoe adhesives and latex foam rubbers.

Fabric Doubling Adhesives

SBR latices have been used for many years as adhesives for plying up fabrics, to achieve greater strength and to improve quality. This is generally accomplished by sticking a strong, heavy-weight fabric to a top layer consisting of a light-weight high-quality cloth. This is just one of the many applications for latex adhesives, which are also used to bond other sheet materials such as paper, cardboard, leather, metal foils and plastics.

TABLE 4

A	Polysar Krynac 803-NS	75.0
	Polysar Krynac 804	25.0
B	Geon 121	40.0
	HiSil 233	25.0
	Zeolex 23	35.0
	Cumar MH2½	15.0
	Triethanolamine	3.0
	Cadmium 2V4	3.0
	Dioctyl phthalate	25.0
C	Spider brand sulphur	2.0
	Zinc oxide	5.0
	Stearic acid	2.0
D	Naugawhite	1.5
	Black	1.0
	MBTS	1.0
	TMS	1.0
Compound viscosity		63
Mooney scorch (min. at 212 F.)		18
Specific gravity		1.23

Unaged vulcanizate properties

	Cure time (min. at 330 F.)	
Hardness, Shore A_2 (inst.)	2	75
	5	77
	10	78
Modulus at 100% elong.	2	1,030
	5	1,030
	10	1,080
Modulus at 300% elong.	2	2,020
	5	2,090
	10	2,270
Tensile strength, psi	2	2,230
	5	2,330
	10	2,420
Elongation at break (%)	2	360
	5	360
	10	340

The compound was mixed as follows:

1. The polymers were banded on a water-cooled mill.
2. The 'B' part of the ingredients was added. The mill was heated to 300 F. and the compound was banded and worked by cross-cutting, to ensure that the pvc was fluxed.
3. The mill was cooled down and 'C' and 'D' parts were added, and the compound was refined, to ensure adequate dispersion of the curatives.

A great deal of interest has been shown in recent years in high solids (60%) adhesives, rather than the more conventional medium solids (40%) compounds. The high solids speeds up the drying-curing process and lower volume of adhesive is handled by a given application weight. Also, viscosities are normally higher, and closer to the viscosities required for spreading the adhesives, often without the use of a thickening agent.

It is also possible to use these adhesives with varying filler contents ranging from 0-300 parts. As the filler is increased the adhesion is less, but a decrease in cost of the adhesive is also obtained.

Shoe Adhesives

Synthetic rubber latices are used as replacements for natural latex, to bond foxing and bumper components to canvas shoes. Polysar Latex IV is a very promising material to replace natural latex.

A CIC Engineering Ltd. machine in use in the Polymer Corporation laboratories at Sarnia, Ontario

Latex Foam Rubber

Applications for foam rubber in the shoe industry include insole cushions, ankle pads for boots, and orthopaedic shoe inserts of various shapes and sizes.

For the manufacture of foam rubber, the position of high solids butadiene-styrene latices in blends with natural latex has become firmly established in recent years. The aim has been to replace natural rubber latex completely in this application, and so eliminate price and quality fluctuations, and the difficulties encountered in the storage and handling of a natural product. These aims have now been achieved with the very recently-announced Polysar Latex 723. This latex offers modulus properties which permit a reduction in the cost of foam rubber through an increase in the load-carrying capacity.

Such a latex will be of interest to the shoe industry, because the advantages of foam rubber can now be obtained using only synthetic latex, and in addition, lower foam densities (less rubber, more air) may be employed with no reduction in cushioning or comfort characteristics. With synthetic latex there is no sacrifice in flex or set properties compared to natural latex foam, and ageing properties are improved. These three properties — *flex, set* and *ageing* — are probably of more importance in the use of foam in shoes than in any other foam application.

The use of synthetic latex alone, with fillers, results in a foam rubber which is competitive in raw material volume cost with the newly-developed plastics foam such as polyurethanes. The deficiencies of polyurethane foam would show up very markedly if used in shoes, particularly the higher set and poor ageing properties under warm, humid conditions. Furthermore, the comfort and cushioning properties of foam rubber cannot be duplicated.

Butyl Rubber

While butyl rubber has only been used to a limited extent in the footwear industry, there is now a much more definite interest in its use, following the development of moulded wellington boots, which employs a resin-cured bladder.

Butyl rubber, having excellent heat-resistance, is the ideal rubber for bladder curing. In general the best results will be obtained in compounds using a resin cure, but an alternative curing system can be based on the quinone type cures.

The advent of moulded wellington boots has, of course, led to the introduction of the wide use of synthetic rubber in this field, both with regard to SBR for general-purpose wellingtons, nitrile rubber for oil-resistant boots, and butyl rubber for specific applications where chemical resistance is called for.

FOOTWEAR AND CLOTHING

New Fabrics Incorporating Urethane

ADHESIVE SYSTEM FOR TRANSFER SPREADING DEVELOPED

By J. M. BUIST and W. F. SMITH,
I.C.I. Dyestuffs Division

THE uses for polyurethane flexible foams are increasing continuously and most applications developed so far have employed the capacity of the foam to cushion the effect of variable loads. Foams of differing physical properties, which are required for optimum performance in the wide variety of current applications, can be readily produced. Fortunately the raw materials for the production of foam can be varied widely in structure, the influence of surface active agents and catalysts in the foam formation can affect profoundly the properties of the final foam, and as has been emphasized recently[1], the choice of a single or two stage process can produce significant differences in the properties of the foam.

Users of the foam products are beginning to appreciate the wide range of properties available and also understand the properties that are important in their particular applications so that, when they specify their requirements, foam producers can select the best recipes made by the best process for these individual applications.

It is appropriate that both sides of the industry should have reached this stage of development at a time when urethane flexible foams are arousing tremendous interest in the textile industry. The combination of urethane foam to fabrics by sewing or by wet adhesives has been carried out for several years, the foam being used to provide thermal resistance to light gauge materials, resistance to wrinkling, and to provide body and plumpness to lightweight textiles.

Recently, however, major advances in technique have been made and it is now possible to combine foam to knitted fabrics where the foam has stabilized the construction so that knitted fabrics combined with foam can be used for outer garments such as overcoats.

The main function of the urethane foam is to stabilize the fabric so that it retains good shape and drape characteristics. Using between $\frac{1}{16}$in. and $\frac{3}{32}$in. thick foam it is found that cotton fabrics are given the warmth and recovery of wools and lightweight wools are given the characteristics of heavier weight wool fabrics. It is also possible to use new constructions, which by themselves would not retain shape but do so when combined with foam, so that some progressive textile companies are already developing new fabrics for combining with flexible foam. Having combined flexible foam to a textile the resulting laminate should and undoubtedly will be regarded as a new fabric.

The marketing of any new fabric is a specialized business involving a great deal of background work to ensure that the fabric has at least the following qualities: —

1. It will withstand washing.
2. It will withstand dry-cleaning.
3. It will perform well in service retaining shape and drape characteristics.
4. It has a satisfactory life.
5. It can be produced in a wide range of attractive fast shades.
6. It can be worked easily on making up equipment.

This list of qualities is not an exhaustive one, but discussion of the above points will illustrate the thesis that fairly exhaustive testing has to be carried out if these new 'fabrics' are to be developed and marketed properly.

Methods of Combination

Apart from sewing, three methods of combining have been developed; these are (a) by flame degradation, (b) adhesive solutions, and (c) transfer spreading of a dry adhesive film.

(a) Flame Method or Fusion Process

This is a specialized method, which was developed and is popular in America, whereby the foam is liquefied or melted by controlled heat from gas jets and is brought into contact with the textile when the surface of the foam is tacky. This process was of particular interest for knit fabrics and its virtues have been stated[2] to be 'the retention of breathability, good drape and stretch characteristics, and a bond that is resistant to dry-cleaning and washing attack, provided all elements are properly prepared'. The proviso no doubt is important.

Special heat laminating machines to operate this process have been developed and some of these incorporate special safety features to prevent overheating of the urethane foam in the case of a stoppage of the machine[3]. In most cases about $\frac{1}{32}$in.

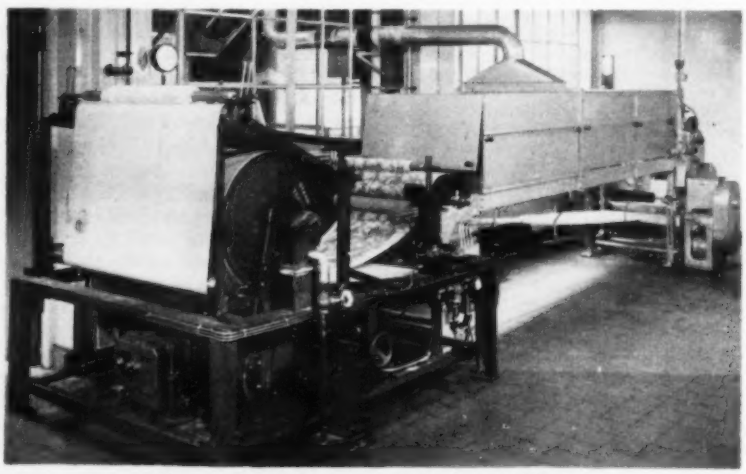


Fig. 1. General layout of suitable machinery

of foam is melted and lost during the process.

(b) Adhesive Solutions

It is also possible to combine foam to textiles by applying a solution of a suitable adhesive directly to the textile or to the foam. Most of the solutions employed have given products which tended to be stiff and had poor drape qualities. Sometimes the wash or dry-cleaning fastness has been poor because of the choice of the adhesive used.

This method has been used primarily with woven fabrics which have a smooth surface; the closer the weave so the danger of penetration of the solution leading to stiffness and loss of drape is reduced. This method has not proved suitable for knit fabrics because of the relatively high amounts of adhesive used, the poor drape, and restriction of breathability.

(c) Transfer Spreading of a Dry Adhesive Film

A new process employing a new adhesive system[4] has been developed in the laboratories of I.C.I. Ltd. at Blackley. The adhesive system is based on a polyurethane rubber (Daltoflex 2S) cured with an isocyanate (Suprasec G).

Stock solutions are prepared by dissolving Daltoflex 2S lumps or chips in a solvent such as methyl ethyl ketone to give 40-45% solids by weight and these solutions are then stored in closed containers. The adhesive solution is prepared as follows: —

Daltoflex 2S stock solution (45% in MEK)	100 parts by weight
Daltorol PR1 ..	4.5 „ „ „
Cellosolve acetate ..	10 „ „ „
Suprasec G ..	10 „ „ „

The Daltorol PR1 and Cellosolve acetate are mixed into the Daltoflex 2S stock solution by simple mechanical or hand stirring. Suprasec G is added and the whole is stirred again. After the addition of the Suprasec G, the adhesive solution has a pot life of approximately two days at 20-25°C. if stored in closed containers. At high temperatures the pot life is shorter.

The composition of the above adhesive solution may be varied to regulate the speed of drying and the residual tack of the film, to suit the running requirements of different types of machinery. Thus the tack of the film may be increased (and the speed of drying decreased) by raising the proportion of Daltorol PR1. It is not advisable to use more than 20% of Daltorol PR1 (weight/weight) in proportion to Daltoflex 2S. The Daltorol PR1, which is isocyanate-reactive, finally cures to a solid rubbery material and is an integral part of the adhesive film. The 'Cellosolve' acetate content may be varied over a wide range and, in cases where the tack of the adhesive film is too great, may be omitted altogether.

The process has been designed so that it can be used on conventional rubber spreading machines. Indeed for this process quite a simple head, consisting of an endless belt carried on two rollers and fitted with a doctor blade could replace the conventional spreading machine. A general layout of suitable machinery is shown in Fig. 1. The spreading machine should be fitted with an endless fabric band coated with a silicone rubber and this silicone belt acts as the carrier for the adhesive film (Fig. 2). The adhesive film is practically dry by the time it reaches the end of the spreading chest and is then transferred by nip rollers to the textile (Fig. 3); the other side of the adhesive film is then brought into contact with the foam sheet (Fig. 4) and the combined laminate is carried round a heated cylinder fitted with an endless fabric pressure band (Fig. 5).

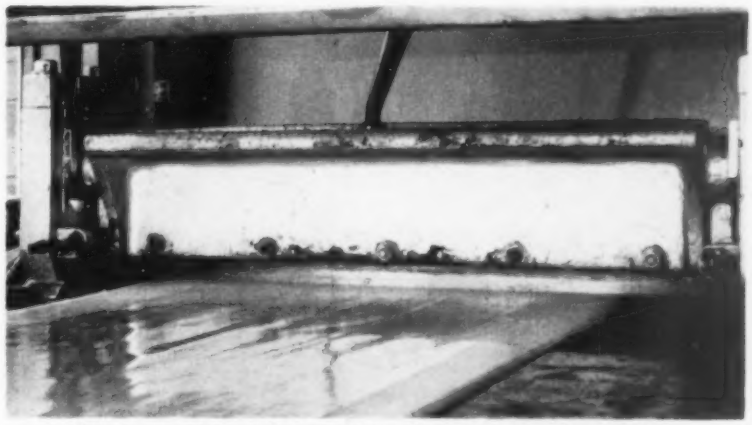


Fig. 2. A silicone belt acts as the carrier for the adhesive film

Using this procedure and this adhesive system it is possible to get dry adhesive film thicknesses of 0.5-0.6 thou. in. (approx. 0.5oz. per sq. yd.) and with these film thicknesses it has not been necessary to apply heat to remove the solvent, most of which has evaporated by the time the film reaches the end of the spreader. The solvent vapour is removed by means of the normal extraction equipment fitted over spreading machines.

After the laminated fabric has passed round the heated drum it is batched up on a roller. The laminate can be handled at this stage but should not be crumpled; curing of the adhesive film continues for three to four days at room temperature and is speeded up at elevated temperatures, *e.g.* 30min. at 125°C.

Woven fabrics, by virtue of their limited stretch, can be laminated to foam at higher rates than knitted fabrics can be. Woven fabrics have been laminated successfully with this process at rates of 10-15yd./min. More work to determine the maximum rates with knitted fabrics is in progress.

Knitted fabrics are more difficult to handle during processing and it is important to carry the knitted fabrics without strain during the combining process. For this reason the layout of the feed and take up rollers in Figs. 3 and 6 is recommended when handling knitted fabrics.

In certain cases, for example with loosely knitted fabrics, it is advantageous to apply the adhesive film to the foam rather than to the fabric. At dry film thicknesses of 0.5 thou. in. the film permits a reasonable degree of air permeability through the final laminate. Improved air permeability may be obtained by the use of a silicone rubber coated carrier which has an embossed surface or a heavy duck cloth coated with the silicone rubber. The application of the adhesive to such a surface produces a discontinuous film and hence the air permeability of the laminate is greatly increased.

When waterproofing is required, an increase in the adhesive film thickness is necessary, and the adhesive solution should be spread on a smooth silicone rubber carrier and transferred to the fabric as a continuous film. These adhesive films can be coloured by pigmenting the stock solutions.

Types of Fabrics

Most types of fabric may be bonded to polyurethane flexible foam by

means of an adhesive solution based on Daltoflex 2S and Suprasec G. Excellent bonds have been obtained with fabrics of the following (see Fig. 7): cotton, viscose rayon, acetate rayon, wool, Orlon, linen, jute, nylon and polyester fibre.

Good results are obtained when knitted fabrics are employed, the foam giving dimensional stability to the knitwear.

Fabrics to be bonded should be free from oils, waxy finishing agents and silicone water-repellents, since the presence of these agents tends to give bonds of inferior strength.

In America the main interest in foam-fabric laminates has been with all types of knit goods from tricots to bulky knits. During the last two years important advances have been made in tackling important problems such as holding the width of the knitted textile, reducing the yardage loss, and elimination of centre creases in circular knit fine gauge jerseys and tricots. Interest in the lamination of urethane foam to all types of woven fabrics continues to grow, but more slowly, in America and it seems likely that this pattern of interest and development will follow the same course in the UK.

Before leaving the question of fabrics it may be desirable to mention double laminated fabrics where the foam provides the inner core construction. If the flame or fusion method of combining is used it must be remembered the loss of foam is doubled.

The adhesive system described in this paper is suitable for use in the production of fabric/foam/fabric laminates. It is, however, necessary to select the type of lining material if maximum flexibility and suppleness of handle are to be maintained. The usual closely woven lining materials are not generally satisfactory as they impart rigidity to the laminate and tend to kink on bending. Lightweight knitted cotton fabrics yield supple and flexible laminates free from this tendency.

Type of Foam

In America polyester foam has been preferred for combining with textiles. Initially this was due to the polyester foam having better mechanical properties, *e.g.* tear strength to withstand stitching. When the flame method of combining was developed polyether foam was more difficult to control than was polyester foam. Polyether foam swells more than polyester foam in dry-cleaning solvents and when certain adhesive solutions were used for combining, the bond to polyether foam could be broken by this high swelling action. The polyether foam itself recovers completely when the dry-cleaning solvent is removed.

These process restrictions which, up to the present, have forced the industry to employ polyester foam (and even to develop specially treated polyester foam having the soft feel of a polyether foam) do not apply when the transfer spreading technique employing Daltoflex urethane rubber adhesives is used. With this process and system either polyester or polyether can be employed and the choice can be made in terms of the properties one wishes to impart to the finished laminate. The thickness of foam to be employed is usually $\frac{1}{16}$in. for the garment trade but thicknesses up to 1in. can be laminated by this technique.

The widespread interest in foam laminates may well create from time to time shortages of supply of foam in thin sheet form, although foam manufacturers are well aware of the requirements. There is ample machine capacity in the country to produce the foam in block form but slitting capacity to produce sheets $\frac{1}{16}$in.-$\frac{3}{32}$in. may be overloaded for a time. The demand for thin sheets of foam has stimulated some manufacturers on the Continent to produce foam in cylinders, or rectangular blocks which are then reduced to cylindrical form, so that sheets can then be peeled off in long lengths by machines which operate on the same principal as veneering machines.

Provision of satisfactory long lengths of foam has also meant that some of the manufacturers producing blocks of foam have had to equip themselves with methods suitable for butt joining foam. Rolls of foam of various widths in continuous lengths up to 100yd. are available now and lengths up to 150yd. are being considered for the near future. When making the butt joint it is important that the joint is a supple one which does not impart a harsh feel along the joint line in the foam.

Many combiners in this country are equipping themselves to manufacture foam laminates; some companies intend to do this work on a commission basis and others will also make up finished articles from the laminates. As the needs of these companies are defined more exactly so the foam manufacturers will be able to plan more precisely how to provide the right kind of foam in the right dimensions, length, width and thickness.

Properties of the Laminates

A brief summary of the important properties of laminates made with the I.C.I. transfer spreading system is given.

Strength

In all cases, the bond between fabric and foam, after using the Daltoflex 2S/Suprasec G-based adhesive, has been found to have greater mechanical strength than the foam itself. Tear failure, therefore, occurs within the foam layer and not at the interface of foam and fabric.

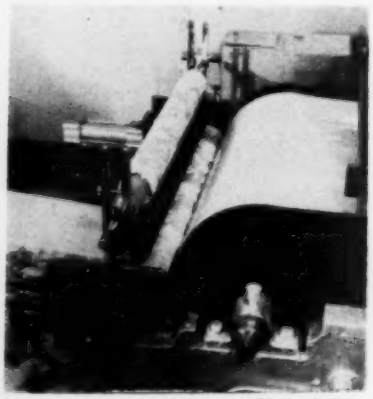


Fig. 3. The adhesive film being transferred by nip rollers to the textile

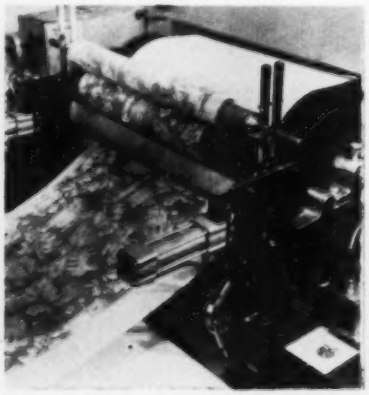


Fig. 4. The other side of the film being brought into contact with the foam sheet

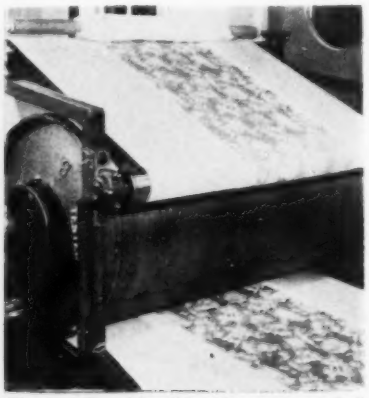


Fig. 5. Combined laminate is carried round a heated cylinder fitted with fabric pressure band

Moulding soles and heels based on 'Butakon' A to boots at the C.W.S. Footwear Factory at Heckmondwike.

Safety boots and shoes are improved by having soles moulded from 'Butakon' A

Safety boots and shoes need soles and heels which are tough, oil-resistant, flexible and waterproof.

That is why the Co-operative Wholesale Society Limited chose soling made by The Berwin Rubber Co. Ltd., Tame St., Audenshaw, Manchester, based on 'Butakon' A nitrile rubber made by I.C.I.

By the use of special moulding techniques, the C.W.S. mould the soles and heels onto safety boots and shoes in one operation, even when the steel toe cap is on the outside of the footwear.

A pair of industrial safety boots with steel toe caps on the outside, from the range made by the C.W.S.

'Butakon'

'Butakon' is the registered trade mark for butadiene copolymers manufactured by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED • LONDON • S.W.1

P864

Air Permeability and Waterproofing

These properties can be controlled, and laminates ranging in behaviour from air-permeable to completely impermeable and waterproof may be made.

Fastness of the Bond to Washing

The adhesive bond is fast to soap and water washing, but boiling in water to which soap and detergents have been added is not recommended.

Fastness of the Bond to Dry-Cleaning

The adhesive bond is fast to dry-cleaning solvents such as trichloroethylene, perchloroethylene and white spirit. The polyurethane foams swell considerably in trichloroethylene and slightly in perchloroethylene and white spirit, but after evaporation of the solvent the foam returns to its original dimensions. As discussed under the section on Type of Foam, polyether foams tend to swell more in these solvents than do polyester foams.

These properties are tabulated below where they are compared with those of a laminate of cotton and polyurethane foam obtained by a flame bonding technique. Bond strengths were assessed by manual peeling apart of the fabric and foam components.

It was observed that the bond strength of the flame-bonded laminate decreased considerably as the temperature was raised. No such effect was observed on the Daltoflex-based laminate.

From the above it will be seen that foam/fabric laminates made by this process have the qualities required as far as washing, dry-cleaning, and retention of shape and drape are concerned. The system is so new that the life of laminated fabrics under service conditions with a wide range of laminates is still being determined but accelerated laboratory ageing tests show this adhesive system to be an excellent one.

One property or quality of the foam which has not been listed is its compression set. If the foam (polyester or polyether) is fully cured there should be no problem in meeting requirements for this application. Much more stringent requirements are required for seating applications.

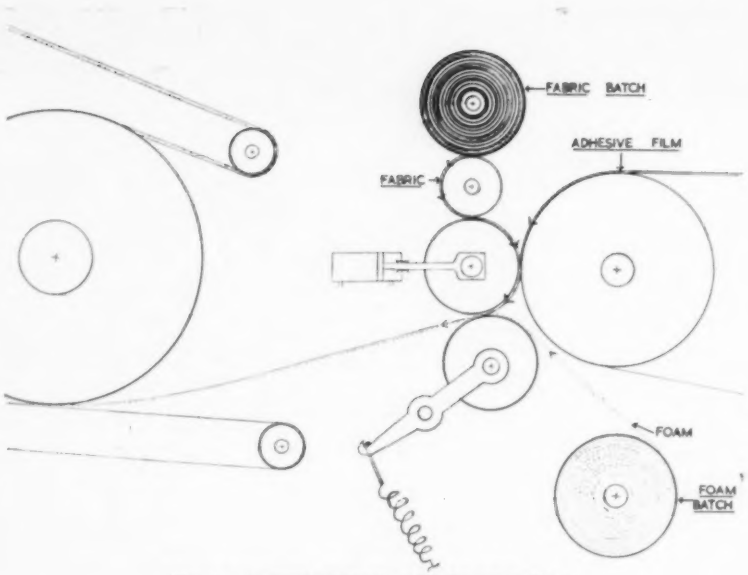


Fig. 6. Layout of feed and take-up rollers

These fabric laminates will be required in a wide range of attractive fast shades and although at the moment the fabric is normally dyed before combining with the foam pigmented during manufacture, this may not meet all requirements or fit in with the textile industries' methods of operation. Work done to date shows that satisfactory dyes, *e.g.* dyestuffs of the acid type, for instance Lissamine Fast Red B, may be used to dye wool combined with polyester foam. Here the problem was to dye the fabric leaving the foam untouched.

Some sewing will be required during the making up of the finished article and it is important that the laminate be of uniform thickness. With the Daltoflex adhesive method this is governed entirely by the limits imposed during the slitting of the foam which can be controlled extremely accurately, *e.g.* 5-10 thou. in. The surface friction of the foam when exposed can create difficulty in moving the foam through the sewing machine but relaxation of spring tension on the sewing foot or aids such as provision of roller foot attachments to feed in the fabric all make these problems temporary and manageable.

FASTNESS PROPERTIES OF SOME LAMINATES

Bond strength after treatment by:

Laminate	Washing		Trichloroethylene		Perchloroethylene		White spirit	
	wet	dry	wet	dry	wet	dry	wet	dry
Wool foam ..	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.
Cotton foam ..	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.
Rayon foam ..	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.
Nylon foam ..	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.
Terylene foam ..	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.
Cotton foam (flame-bonded)	Poor	Fair	V. Poor	V. Poor	Poor	Fair	Fair	Fair.

NOTES: V.G. (= very good)—failure occurred within the foam.
Fair—failure occurred with difficulty at the bond.
Poor—failure occurred readily at the bond.
V. Poor—failure occurred very readily at the bond.
Washing: 10 minutes in 2% soap solution at 50-60° C.
Dry-cleaning: 16 hours' tumbling in the solvents at room temperature.

Applications

Fabric/foam laminates are of interest to the clothing trade as apparel fabrics (particularly for various outerwear applications), linings for slippers, for household and automobile applications, and furnishing materials (for example, for curtains, upholstery covers, quilting materials) and also for bath mats, carpet underlay (foam on hessian) and heat resisting table covers.

Textile fabrics are not the only materials to which foam can be bonded by the method described above. Leather/foam and paper/foam laminates have also been successfully produced, and there is no reason why other flexible substrates should not be used.

$\frac{1}{10}$ in. thick urethane flexible foam weighs about 1.5oz. per sq. yd. and gives about the same insulation as four times that weight of wool batting. The reduced thickness of the foam and lower weight create the opportunity both for better comfort and better styling.

It is sometimes desirable to apply a surface skin to cut sheets of polyurethane flexible foam. Such a film is provided by the adhesive system based on Daltoflex 2S and Spurasec G, and can be applied by a modification of the transfer spreading technique. Pigments and fillers may be incorporated. Leather and other materials can also be coated in this way.

These developments will also stimulate interest in flexible foam for

Continued on page 182

FOOTWEAR AND CLOTHING

Mayflower in Reverse

FIRST STEP IN RUBBER FOOTWEAR BY NORTH BRITISH — IN 1856

By T. W. W. DAVIE,
North British Rubber Co. Ltd.

A history of the North British Rubber Co. reflects the growth of the rubber footwear industry in the UK — since this firm, which was the first to carry out bulk manufacture of rubber footwear in the UK in 1856, has from that time remained amongst the leaders of the industry

THERE is a twist of fate behind the beginnings of the North British Rubber Co., one of the oldest established firms in the rubber industry, and a prominent producer of footwear. It all started with a subtle difference between the patent laws of England and Scotland.

When, midway through the 19th century, Hancock in England and Goodyear in America discovered vulcanization, the patent laws of England did not apply to Scotland. This discrepancy was spotted by an American, Henry Lee Norris, already engaged in the rubber industry on the other side of the Atlantic. And so began what was virtually a reverse voyage of the *Mayflower* — in this case the ship was known as the *Harmonia*.

This was in 1855. Henry Lee Norris landed in Glasgow in search of a suitable factory where he could establish a rubber industry in Scotland. He drew a blank, so he journeyed east to Edinburgh. There he found Castle Mills, a disused silk mills in the hands of the bank, conveniently situated alongside the Union Canal, a waterway linking the Forth and Clyde. Without hesitation he sent word back to America and a few months later the first machinery was shipped, accompanied by four operatives to train Edinburgh workers to make rubber products.

First American Investment

The firm started out as Norris and Co., but in September 1855 was restyled the North British Rubber Co. It was the first corporate investment of American capital in the UK, and the beginning of Scotland's rubber industry. And it has now been the backbone of the industrial life of Edinburgh for 105 years.

The visit of Henry Norris led not only to the birth of the rubber industry in Scotland, but to the birth of rubber footwear in the UK, for the records show that the first item of production by North British in 1856 was some form of galosh. This is believed to be the first known record of bulk manufacture of any type of protective footwear.

In due course a rubber and canvas shoe was added — the plimsoll. From these were developed sports shoes. But a landmark was reached with the creation of the wellington boot — a development in which the Scottish firm were pioneers. This form of wet-weather protection had its biggest test in World War I with the appalling conditions of winter trench warfare. But for rubber footwear the welfare of our troops would have been seriously jeopardized. This was one of the biggest contributions made by North British Rubber to the general war effort from 1914-18. Well over a million British and French troops wore boots made at Castle Mills.

After the armistice the designers at North British looked for ways to develop wet-weather protection far beyond the emergencies of wartime. The idea of wellingtons was begining to catch on for many industrial uses, in particular agriculture. Of course, for those engaged in deep-sea fishing the rubber boot of thigh height was part of their outfit. And that still obtains today. At the same time the light wellington had become a 'must' for children of all ages.

Fig. 1. North British's Ladibird casual, with moulded sole and heel

In the twenties came the first signs of waterproof protection with a fashion appeal — ladies' overboots for wear over the foot or over the shoe. New ideas in summer footwear were tried out — what were known in those days as promenade shoes with bright coloured fabric uppers. These ideas were really glamourized versions of sports shoes, but they found a ready market both in this country as well as overseas.

But it is in the last 15 years that the rubber footwear industry has undergone a complete transformation. and here again North British have been pioneers.

Move to Dumfries

At the end of World War II an additional factory was acquired at Dumfries in South-West Scotland, primarily with the idea of widening considerably the range of fabric footwear. It meant, too, the training of new labour in an area with no real industrial background. That the risks involved were fully justified were evident by the company's decision in 1955 to transfer all of its footwear production to Dumfries.

Parallel with new ideas in design were new techniques in production. The conveyor method was first introduced to this country in 1948. By means of moving jacks on which are mounted the metals lasts, teams of operatives, each responsible for two or three operations, are able to 'build' the shoe or boot from start to finish. In the manufacture of wellington boots this new method was an immediate success, increasing output substantially, as against the old method of each operative being responsible for the product from start to finish. This method of production for rubber boots is still the method in use at the Dumfries plant.

The conveyor method of construction in fabric footwear is now largely confined to sports shoes; fabric casuals employ the moulded sole method of production. So much for manufacturing techniques. What changes have taken place in the product itself?

About 12 years ago the first of

many new ideas in design came on the scene: gay fabrics in a variety of materials with attractive trim using lasts specially designed for ladies' casuals. This approach was just as much in evidence in children's footwear. These were the beginnings of a trend in casual, inexpensive footwear. Yet the efforts of ten or 12 years ago seem almost archaic beside those in the shops today. Slip-lasting and moulded soles and heels have allowed our designers to produce ideas in fabric footwear which would not have been feasible by old methods of construction. North British sensed the wide acceptance that could result from these opportunities. They established a development and design team that in recent years has travelled all over the Continent and America to bring to the footwear trade of Britain a range of casuals — called Keds — that is now the biggest selling line of its type in the UK.

Comfort In

With all these developments in the styling of fashion footwear, there was still room for improvement in industrial footwear. Cushion insoles, shank supports and more modern lasts were introduced — designed to ensure greater comfort for those whose jobs demanded long hours in waterproof footwear.

Rubber footwear is meeting the heavy demands industry put on it. There are specialized boots for miners, oil workers and canners, apart from the range of safety boots with steel toecaps and steel or vulcanite midsoles to withstand penetration from under the foot. These steel toecaps are to BSI Grade 1 specification. In the past ten years safety footwear has become big business.

Fig. 2. Heavy work tackled with the aid of North British's Rockwell thigh boot. This features a reinforced vamp and vulcanite midsole. Its steel toecap is made to BSI specification grade A1

Fig. 3. Discussing a special ankle boot produced for gold mine workers in Ghana. G. W. Allison *(right)*, **of North British's footwear development team, visited West Africa during the preparation of this boot**

An interesting development in protective safety footwear was the creation by North British in 1959 of a steel toecap boot of special design for wear in the gold mines of Ghana. This resulted from legislation by the Ghana Government, which made it compulsory for all African underground workers to be issued with a mining boot of a type approved by the mines department in that territory. Because of the harsh abrasive rock it was necesary to create a boot of extra tough quality rubber. That specification was fulfilled after intensive development work and on the spot experience with actual working conditions.

NEW FABRICS Continued from page 180

general insulation work. Flexible foam is used for insulation of chemical plant, for example, low pressure steam lines, and at the moment the surface has been protected by a pvc coating. The availability of a range of thicknesses of urethane foams with a pvc coating on one face will permit this form of insulation to be used on a more extensive scale than hitherto.

There have been developed a number of very varied applications in which urethane foams (rigid and flexible) are being employed. Progress in any one of these diverse fields contributes to our general knowledge about urethanes and this in turn helps to advance progress in the other applications. No doubt the experience gained with these new fabrics, which will be treated and maltreated like any other new fabric, will add significantly to our knowledge of the performance of urethanes. In a brief review of this kind it is difficult to emphasize all the relevant features, but the appreciation that the provision of acceptable service imposes the discipline of adequate product quality control is probably the most important. Maintenance of high quality along with collection of a detailed knowledge of the production and service aspects of foam/fabric laminates are a prerequisite of all concerned with the proper development of these new applications.

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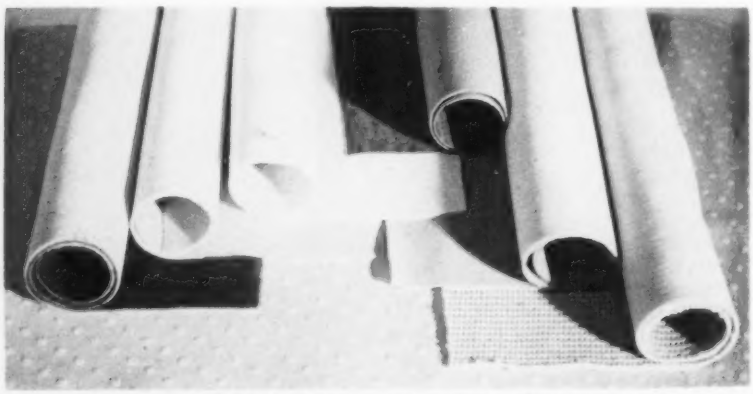


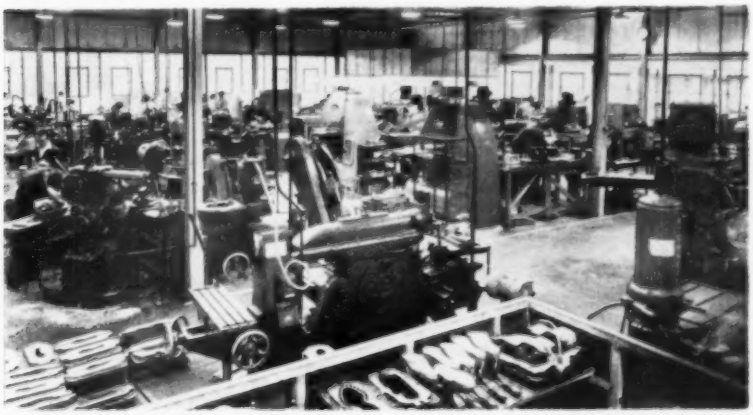
Fig. 7. Selection of fabrics bonded to urethane. Terylene knitted in the background); *(left to right)* **Terylene (Crimplene), nylon (knitted), Terylene woven lightweight open weave, Terylene flax (woven), wool knitted and cotton knitted**

FOOTWEAR AND CLOTHING

Direct Vulcanizing Machines

NEW SLIPPER MACHINE DEVELOPED BY CIC

IN the last 10 years, of the shoes produced in the UK with leather uppers, the percentage with non-leather soles has increased from approximately 24 to more than 75.



A general view of one of the mould-making shops of C.I.C. Engineering Ltd., manufacturers of a wide range of direct vulcanizing machines for the shoe industry

This rapid development of rubber soled shoes has been greatly assisted by the parallel development which has taken place in high pressure moulding equipment, including machinery for the direct moulding of microcellular soled shoes.

The production of machinery of this type has been pioneered in this country by CIC Engineering Ltd., of Bath, and the machines in their present range include the Marks III, IV and VI High Pressure Vulcanizing machines, the Python wellington boot moulding machine, an injection moulding machine and other ancillary equipment such as the Sellomatic Box making machine and a flash trimmer.

Slipper Machine

Their latest development is the CIC slipper machine, a photograph of which appears on this page. The manufacture of slippers is growing in the UK and the CIC machine is one of the few being made here. It is a precision machine developed for the sponge rubber bottoming of slippers, casuals, bootees, men's shoes and sandals. It has a cast iron body and is capable of withstanding the pressure developed in manufacturing a size 12 men's slipper.

Accurate location of mould to last is an important feature which permits interchangeability of moulds between machines without loss of true in setting. Both moulds and lasts are thermostatically controlled, enabling a consistent standard of moulding to be maintained. The machine with a single mould can be fitted with two lasts on a rotating head so that the operator can be preparing a second upper while the first is being vulcanized. The machine can also be readily adapted for use with a single last. The moulds are made in aluminium alloy to a high degree of accuracy in the CIC foundry.

Injection Moulder

The CIC plastic injection moulding machine is fully automatic, is capable of producing 90 pairs of shoes per hour and will mould pvc soles to leather or fabric uppers, or make complete pvc shoes or sandals. It is fitted with a screw type injection head with a water cooled chamber and the rotary table carries five pairs of moulds which are opened and closed pneumatically.

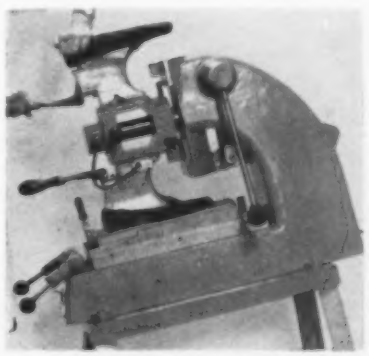
The Mark IV high pressure vulcanizing machine was designed for the introduction of direct moulded microcellular soling to the footwear industry but can also be used for solid rubber moulding, the change-over being simply effected by dropping a switch on the back of the machine.

The method of producing microcellular rubber soles by direct moulding involves the same procedure as for the production of normal microcellular rubber but all stages are completed continuously in the same mould. The CIC method developed about a year ago was described in *RPW* January 7, 6, and results in a shoe sole which has an outer skin of solid rubber surrounding a microcellular interior.

Blowing Control

It is of paramount importance to control the expansion of the rubber accurately and a unique feature of the machine is its ability to mould automatically at full pressure for different pre-determined times. When the blowing stage begins, the expansion of the rubber is both mechanically and hydraulically controlled by the movement of the sole mould so that the downward pressure of the rubber's expansion will not affect the drop rate of the sole piston, which has been pre-determined.

The machine automatically changes to full pressure again for the last minute of the curing cycle (thus vulcanizing the layer of rubber next to the upper and insole without expansion, ensuring good adhesion) and the mould opens automaticallly when the process timer reaches zero. Should the sole piston drop either too fast or too slowly due to incorrect blowing of the rubber, a fault mechanism automatically opens the machine. The rate of drop can be varied from 0.016in. to 0.050in. per min. and this permits the production of soles from different grades of compound from hard resin rubber to soft resilient types and with different densities. The pore size of the sole can be varied so that it is uniform throughout the sole or increases from sole surface to insole.



The C.I.C. slipper machine developed for the sponge-rubber bottoming of slippers and shoes

FOOTWEAR AND CLOTHING

Technical Service for the Shoe Industry

12% OF ISR ENQUIRIES DEAL WITH FOOTWEAR

By NORMAN WEYMOUTH,
International Synthetic Rubber Co. Ltd.

THE mechanization of the boot and shoe industry began towards the end of the last century with the replacement of hand tools with powered machines designed to take over the tasks formerly undertaken skilfully but slowly with knives and pincers, hammers, rasps and scrapers. Although these machines removed much of the drudgery they did not remove the craft for the quality of the final product still depended upon the shoe being presented correctly to the machine at the various stages of manufacture.

This advance, however, represented the first step in what has amounted to a revolution in modes, methods and materials and the use of manpower in the footwear industry, and was followed in the 1920s by the introduction of new adhesives and cements which were used to join uppers and bottoms. New synthetic materials of various kinds have also arrived, of course, particularly since 1945, and the compounding of rubber with synthetic resins has brought new shoe solings with vastly improved qualities for the operator, the manufacturer and the wearer.

Successful Introduction

The development of these materials in Britain began in the 1940s and its successful introduction is a tribute to the research workers in the petrochemical and synthetic rubber industries, and to the rubber compounders. Above all, however, credit is really due to the UK footwear industry itself which has encouraged the rapid growth and acceptance of resin rubber to the stage where it is no longer considered an alternative material, but is an accepted soling material in its own right.

Total Consumption

In considering the raw materials used in the footwear industry it is, of course, always important to distinguish between conventional rubber footwear and footwear which was formerly wholly or partly of leather and fabric but which now has expanded or non-expanded resin rubber soling either sewn, stuck or moulded on to the upper. The total rubber consumption in the industry is over 26,000 tons per annum, including both natural and synthetic, and this figure is therefore to be divided between the two uses mentioned above. The encouragement given by the UK footwear industry to the new materials is perhaps best shown by the statistics of the last few years. In 1955 resin rubber accounted for 20% of all soling materials used in this country. Today 75% of all types of shoes have non-leather soles and the continuing increase in the use of resin rubber may well mean that the overall consumption figure of rubber now standing at 26,000 tons may rise to over 30,000 tons a year up to 1965.

SBR is being used in increasing quantities in non-rubber footwear—*i.e.* footwear with leather and fabric uppers — with expanded or non-expanded resin rubber or moulded on bottoms. This covers a very wide range and volume of boots and shoes and the increased usage is due not only to the consistent quality and stable price of SBR but also to its good compatability with high styrene copolymers. This factor also applies to some extent to solid and microcellular direct moulded footwear on which thinner, harder and firmer bottoms are being vulcanized.

Translucent Solings

For translucent and transparent solings the use of SBR is becoming more and more popular, since with silica reinforcement it provides soles which can be tinted to almost any desired shade. Pale crepe is also used in this type of soling which is really designed to overcome the disadvantages of unvulcanized crepe — freezing in cold weather and becoming sticky in hot weather. Translucent soling does not spread and has particularly good abrasion resistance. The use of SBR is rapidly increasing in the production of soles and heels because of speedy processing and the reduced power consumption (and therefore cost) needed to obtain the low Mooney plasticity required, particularly for sponge applications.

In the manufacture of rubber sponge, research at the International Synthetic Rubber Co.'s technical service department has confirmed that the thermoplasticity of the compounded stock must be carefully controlled. If the stock is too soft at room temperature spreading occurs on the lower section of the stacked cut out blanks. If the stock is too stiff the resistance to expansion by the gases is too great to permit low blown densities.

The thermoplasticity of stocks containing SB rubbers is limited, and it is usual to soften these stocks by the mastication of the polymer and the addition of oil to the compound.

In the case of a particular sponge

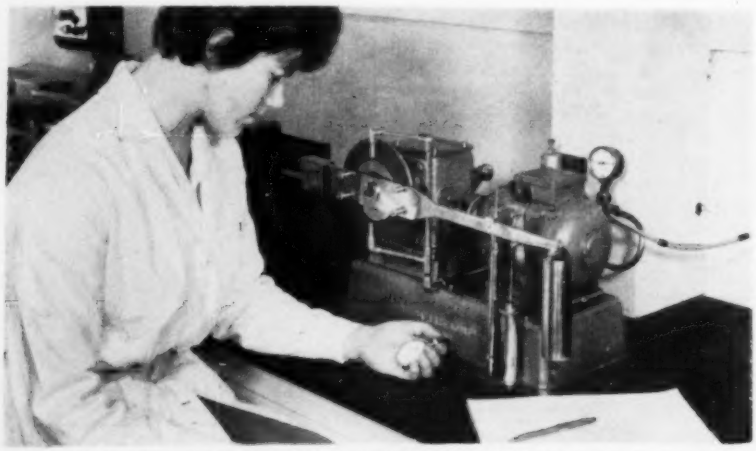


Fig. 1. Evaluation of the wear characteristics of an SBR shoe-soling compound at ISR

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compound designed for vulcanization while the stock was free to expand at vulcanization temperatures it was found to be difficult to handle at room temperatures, and excessive spreading of the blanks was obtained when stored over a period. It was found, however, that when thermoplastics, such as polythene, and phenolic resins were used in the stock the otherwise soft compound was firm at room temperature but the resistance to blowing at elevated temperatures was not increased. An examination of the Mooney viscosity values at 25°C. and 150°C. determined the amount and type of thermoplastic additive to be used.

When the sponge technique is applied to direct vulcanization slipper manufacture other features need to be recognized. The vulcanization cycle must be short, yet maximum expansion must take place and with a temperature step of some 50°C. between the base of the sole and the felt upper. The blowing must be completed before set-up occurs. Further the amount of total expansion must be such that when it is restricted to 200% the restricted expansion will provide sufficient residual pressure to form a good bond both at the felt upper and to the sheet of semi-vulcanized solid sole which is sometimes used.

The establishment of a UK source of SBR in 1958 has encouraged more footwear manufacturers to consider this material in the production of their footwear and this is very much reflected in the activities of ISR's technical service department.

An analysis of the work carried out by this department reveals that something over 12% of the enquiries received and the reports issued have been for the footwear industry and that over 2,000 man hours of laboratory work has been completed on this subject within the last year alone. (It is interesting to note that this 12% approximates to the rubber consumption figure for the footwear industry as against the total UK rubber consumption for all industry.) The interest in SBR in footwear is also shown by the fact that a booklet called 'Intol in Footwear', printed less than a year ago by ISR, has already been reprinted (with some new formulations). Many of the enquiries received at ISR are confidential and, of course, cannot be released for general publication, but the ideas behind the answers are always available and are continually being applied. It is perhaps useful to list the types of problems dealt with during the past year. These are broadly: —

Fig. 2. Compounding a shoe formulation at ISR's technical service laboratory

1. The comparison of various polymers.
2. The evaluation of new materials for the industry.
3. Attempting to advise manufacturers on ways of maintaining constant product cost and quality during periods of price fluctuation of raw materials.
4. Comparisons of commercial equivalents of main raw materials.

As far as the more detailed work is concerned, this has been concerned with such items as: —

1. Investigations into factors affecting the colour of translucent solings.
2. Factory processing problems.
3. Investigations into expanded solings and sponge.
4. Development of DV solings using 100% SBR.
5. General investigation and research into resin solings and blown resin.
6. General work on soles and heels and weatherproof footwear.
7. Testing of customers' compounds at their request.

In addition to the work carried out specifically for the footwear industry, the general activities of the technical service department on the various aspects of SBR technology — mastication, calender shrinkage, ageing, extrusion, tackability and so on — are often, of course, of interest to the footwear industry.

The footwear industry therefore, is an example of the success of a policy of setting up this type of service for manufacturers and it is clear that a certain amount of educational work is necessary and of advantage to all concerned when offering a new material, since purely commercial considerations alone do not necessarily justify a change in methods of production. As far as the footwear industry is concerned, in the preparation of its booklets as in its other activities ISR has had the considerable assistance and encouragement of such organisations as the Man-Made Soling Association, the British Boot, Shoe and Allied Research Association, and the British Footwear Manufacturers Federation.

THE IMPACT OF POLYMERS Continued from page 170

Awkward Stage

The trade is in that awkward stage where both rapid expansion and technical development are wanted at the same time. Several firms, large and small, are hurrying to be among the first; for some it is their traditional line, others are simply anxious to miss nothing.

In such a situation, quality can suffer to the ultimate detriment of the business as a whole. It is therefore good that the more reputable manufacturers have recognized the danger and set themselves high commercial standards as a duty to the consumer and to the industry.

Quite a large trade is already developing. For instance, in the early part of the year, Lintafoam Ltd., in what they regarded as only pilot scale production, were turning out 30,000yd. of foamback per week and were having to ration their customers. Mass production is about to start now, and the company is so convinced of the potentialities of the new material that, in the autumn, they will run an advertising and 'commercial education' campaign.

Not only does the process convert some quite useless fabrics into useful ones, but it may double or treble the value of ordinary fabrics. A nylon face cloth of 7oz. foambacked and having a nylon lining might have an overall cost, combined and ready, of 17s. 9d. and make up into a coat whose equivalent, without foam, would have to be in 20oz. material at a cost of 30s. — producing a coat three times as heavy.

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The Institution of the Rubber Industry London

Founded 1921

the Institution today

The centre of a great fraternity of rubber manufacturers, scientists, technologists, executives, students and others in many countries of the world.

main objects

To promote the profession and practice of Rubber Technology.

To award Diplomas.

To arrange lectures and the reading of papers.

To encourage original work and research.

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Annual Reports on the Progress of Rubber Technology.

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Scottish Successes at Gleneagles

IRI GOLFING SOCIETY WALLWORK CUP

THE 1961 Wallwork cup final of the Institution of the Rubber Industry Golfing Society was played at Gleneagles, Perthshire, recently (*RPW*, June 24, 1023). The Scottish section were the hosts to the Manchester and London sections.

Gleneagles, as a venue for this kind of week-end, needs no advertising. The weather, with the exception of about an hour of rain, was very nearly perfect for the whole of the meeting.

Team matches commenced on the Saturday morning with Scotland playing Manchester. In the afternoon Scotland played London and on the Sunday morning, London played Manchester.

There were alternative Stableford competitions for those who were not taking part in these matches.

The Monday was devoted entirely to the Wallwork Cup Trophy, the first 18 holes being played in the morning on the King's Course, and the second 18 holes in the afternoon round the Queen's Course.

Annual General Meeting

At the annual meeting R. N. Ferguson was once again confirmed as the president of the society, G. C. Swann was re-elected as honorary secretary and treasurer, and E. Cheetham was re-elected as the honorary auditor.

As announced in a previous issue, the Wallwork cup was won by a member of the Scottish section — W. W. Somerville, with a net score of 139, being played off a handicap of 6. The runner-up was the president, R. N. Ferguson, with a net score of 148, playing off a handicap of 10.

The best scratch score went to S. T. Diggle with a gross score of 163 and a handicap of 3. Third was S. K. Roberts, net score 149, and fourth was D. Chesney, with a net score of 152.

The best morning round went to L. V. Jennings, of the London section, and the best afternoon round to J. Campbell, Scottish section. The second morning and the second afternoon rounds went respectively to John Gallie and to M. Ferguson.

Scotland retained the Ferguson Trophy with an aggregate of 1,255 points against Manchester's 1,269 and London's 1,279.

Continued on page 192

Golfers at Gleneagles (*left to right*): **1. E. Ellery. 2. D. Chesney, R. McEwan, W. T. Davey, R. N. Ferguson, E. Ellery. 3. R. N. Ferguson, W. T. Davie. 4. W. S. Alexander, E. Cheetham. 5. R. N. Ferguson (president IRI golfing society), D. Davies (London captain), T. Davey (Scotland captain), W. Somerville (winner, Wallwork Cup), Mr Sheywood (Manchester captain). 6. Dave Chesney, J. Campbell. 7. Back row — L. V. Jennings, S. T. Diggle, A. Louden, W. D. Porter, P. Bell. Middle row — J. Campbell, L. Johnson, W. Davey, S. K. Roberts, J. Dexter. Front row — W. S. Alexander. 8. A. Landen and G. Betts**

Plastics Statistics

JUNE EXPORTS AND IMPORTS

PLASTICS materials exports in June 1961 increased by nearly 3,000 tons over the tonnage for the same month last year; 16,069 compared with 13,147. Value also increased from £3,340,879 to £3,302,034. The May 1961 figure was 15,920 tons (£3,462,755). This position is revealed in the official Trade and Navigation accounts, which show that Hong Kong again took the biggest quantity (1,281 tons), followed by Sweden (1,019), Denmark (860) and France (697).

Import figures were again lower: 7,713 tons (£2,499,871) against 9,427 (£2,682,035) in June 1960. Western Germany was the main supplier with 1,714 tons, followed by USA with 1,472 tons. Imports for the first six months of the year were 39,789 tons (£13,343,481), compared with 48,398 (£15,081,080) for the corresponding period in 1960.

Exports for the first six months of this year totalled 96,222 tons (£21,926,717) compared with 89,382 (£22,908,954) in 1960 for the same period.

Details of imports of plastics materials during June 1961:

	Tons	£
Acrylics	418	121,830
Alkyd solid and liquid resins, solutions, emulsions and dispersions	312	56,745
Cellulose plastics:		
Acetate butyrate	46	46,776
Photographic (including cinematograph) film base (except acetate butyrate)	134	184,619
All other	189	122,972
Polyamides	437	292,295
Polystyrene	282	85,561
Polyvinyl chloride:		
Polymers and copolymers	1,896	252,126
All other	887	259,428
All other	3,112	1,072,519
Total	7,713	2,499,871

Exports of plastics materials during June 1961:

	Tons	£
Acrylic sheet, rod, tube, film, foil and profile shapes in primary form	550	323,641
Alkyd solid and liquid resins, solutions, emulsions and dispersions	528	104,949
Aminoplastics:		
Solid and liquid resins, including solutions	994	110,453
Moulding and extrusion compounds	878	143,669
Cellulose plastics:		
Moulding and extrusion compounds	261	86,378
Sheet, rod, tube, film (excluding regenerated cellulose), foil and profile shapes in primary form	162	111,978
Phenolics and cresylics:		
Solid and liquid resins (straight and modified)	742	124,735
Other	857	232,818
Polystyrene	1,301	233,385
Polythene (polyethylene) sheet, rod, tube, film, foil and profile shapes in primary form	121	47,049
Polyvinyl chlorides:		
Polymers and copolymers	1,389	182,786
Moulding and extrusion compounds	984	205,549
Sheet	570	221,422
Other	48	17,182
All other	5,664	1,088,664
Waste and scrap (including celluloid and film waste and scrap)	1,020	106,221
Total	16,069	3,340,879

UK exports to countries in the European Economic Community (Common Market) and the European Free Trade Association are shown below.

Exports to Commonwealth countries during the month were 4,053 tons (3,871 in 1960) and exports to all other foreign countries were 6,387 tons (5,284 tons).

EXPORTS TO EEC

	June 1960	June 1961
Western Germany	334	480
Netherlands	410	620
Belgium	350	597
France	38	274
Italy	672	382
	1,804	2,353

EXPORTS TO EFTA

	June 1960	June 1961
Sweden	690	1,019
Norway	328	570
Denmark	551	860
Switzerland	257	274
Portugal	296	405
Austria	66	148
	2,188	3,276

(Any apparent discrepancies are due to rounding off of figures)

STABILIZERS FOR PVC

Continued from page 157

from which to choose and, second, the industry is constantly investigating new products and making them available for consumers.

This article has only been a guide to the industry. There are many products other than those described and new materials are being developed continually. The prospective user is therefore advised to survey briefly the range of products available to him, as here described, and then contact the firm in whose products he is interested.

It should be kept in mind that the suppliers provide two types of product. Among the first are the straight stabilizers such as the various metallic salts and soaps, and the second type is proprietary mixtures. The former can be used either direct or in mixtures designed by the company concerned and the second can be used for pvc compounding without further additions. Both methods are used extensively today.

The sixth (and final) article of the series, which will appear next week, will deal with other considerat ons which have an important bearing on the choice of a stabilizer. Aspects covered include dispersions and liquid stabilizers, toxicity and the effects of stabilizers on other compounding ingredients and on the properties of the final product.

New Shell Curing Agent

Shell Chemical Co. has added Epikure TET to its range of products. This brings the number of Epikure cold curing agents for use with Epikote resins to four — Epikure T, RTU, TET and V125.

V125 is a high viscosity polyamide which is useful in formulating stopping compounds, fillers, etc. T and RTU are modified amines and, due to the high exotherm developed by the systems on cure, they are used for *small* electrical castings and laminating applications. Where there is a need to cast slightly larger masses than is possible with Epikure RTU and T and cure at room temperature, Epikure TET is recommended as the exotherm of this system on cure is lower.

London Office for Halsteads

James Halstead Ltd., Crow Oak Works, Whitefield, near Manchester, whose products include flexible pvc tiles and sheeting and stair nosings and covings, has opened a London Sales Office at 44 Pall Mall (WHI 7234).

Plantation Newsletter

RUSSIAN SHIPS AT PORT SWETTENHAM

by our Malayan Correspondent

FROM KUALA LUMPUR

AFTER an absence of more than three months, Russian ships have again started calling at Malayan ports to load rubber. Two ships, the *Dobossary* and the *Mettallurg Kurako*, have just loaded 3,000 tons at Port Swettenham.

These two ships are the first Russian freighters at a Malayan port (excluding Singapore) since March and many dealers believe that with their arrival the price of rubber may improve. Russia is described as the 'bull' behind the Malayan market and when she enters as an active buyer the price invariably rises.

There is also strong indication that Russia continues to buy substantial quantities of natural rubber through the London market.

Up until the end of May, Russia had bought 45,612 tons of rubber from Malaya this year, dropping from third to fourth in the list of this country's best customers so far for 1961.

The leaders were: Britain, 81,032 tons; USA, 49,006 tons; Japan, 48,061 tons; Russia, 45,612 tons; and West Germany, 35,755 tons. Buying by China mainland has been insignificant, a mere 2,434 tons in the first five months of this year.

Total tonnage shipped from Malaya in the first five months of 1961 to all countries was 461,416 tons against 456,451 tons for the corresponding period of last year.

In the meantime, it was announced here that work on the new Dunlop Rubber tyre factory at Petaling Jaya should start in about three months' time and be completed in 18 months. Once completed the $12m. factory will be capable of producing all the tyres — car, lorry, motor cycle and bicycle — to meet this country's requirements.

The demand for tyres in Malaya increases monthly. Statistics show that one new vehicle takes to the road every 15 minutes round the clock.

It is estimated that an average of 100 new vehicles are registered every 24 hours in the Federation. In the first five months of this year, 15,787 new vehicles were registered, thus taking the total of registered transport in the country to 201,264.

Plantation Housekeeping

One of Malaya's leading planters, H. B. Bruce, of Wardieburn Estate, near here, who has been associated with rubber and tea planting both in Ceylon and this country for 39 years, left on retirement but not before giving some advice to those remaining behind.

Said 59-year-old Mr Bruce: 'Planters will not only have to rely on an increase in their crops from using high-yielding clones to compete with synthetic, but I feel great improvements must be made in the rubber factories in cleanliness, manufacture and grading and packing of finished products'.

Mr Bruce, who has been chairman of both the Pahang and Selangor Planters' Associations and a member of the Rubber Supervision Licensing Board, believed that production costs in synthetic will be very difficult to maintain at a lower cost than natural rubber, which therefore, he forecast, had a great future.

Thieves in Selangor

The police force in Selangor are having a difficult time tracking down a series of thefts of aluminium sheets from rubber estates in central Malaya. It is believed that an organized gang is at work.

In recent weeks a number of estates have reported losses of large amounts of aluminium sheets which are used for rubber coagulating tanks. Only a few days ago, one estate at Jinjang, 14 miles from here, reported the loss of 377 aluminium sheets.

Training Plantation Workers

The National Union of Plantation Workers is now busily organizing general courses for up to 20,000 youths working on rubber estates. These short-term courses are designed to teach them something about civic responsibilities, politics, general knowledge, elementary economics and trade unionism.

The courses are aimed at youths in the 16 to 21 age group, who although eligible to join the union cannot hold office until they are 21. This scheme, which if handled properly can prove most beneficial, has generally been welcomed by planters.

It is hoped by the end of this year several thousand of these young workers on estates will have attended these courses.

As the president of the union, Senator S. P. S. Nathan explained, it was imperative that these young people, many of whom had not received a great deal of real academic schooling, should be brought up-to-date on what was happening around them.

He said it was of tremendous importance that the workers came to understand how much Malaya's prosperity depended on rubber. 'This understanding is not only necessary in the interests of the industry alone but also of the nation itself', he added.

Rubber Statistics

WORLD SITUATION DURING APRIL

THE following advance information on the world rubber situation during April and the latest revised figures for March 1961 have been issued by the Secretariat of the International Rubber Study Group (in long tons).

NATURAL RUBBER	March	April
Production	167,500	—
Deliveries from stockpiles[1]	1,000	1,500
Consumption ..	167,500[2]	157,500[2]
STOCKS END-PERIOD		
In producing areas ..	262,500	262,500
In consuming areas ..	225,000	225,500
Afloat	235,000	—

[1]Deliveries from the Government stockpiles of the United States of America and the United Kingdom.

[2]Including estimated imports into the USSR of 29,000 long tons in March 1961 and 73,750 during January/March, and estimated imports into China of 3,250 in March, and 18,000 during January/March, and 5,250 long tons in April.

SYNTHETIC RUBBER	March	April
Production	157,500	152,500
Consumption ..	152,500	145,000
STOCKS END-PERIOD	355,000	357,500

Reported exports of rubber from Indonesia during March 1961 amounted to 58,913 long tons of which 18,838 long tons were reported as being of estate origin.

Malaya

Shipments of sheet and crepe rubber from Malaya rose to 87,302 tons in June from 83,675 tons the previous month. Of the June total, the UK took 11,824 tons, USA 10,839, West Germany 6,119, Japan 8,515, USSR 10,614, other European countries 21,918, Commonwealth countries 7,315, and other countries 10,158.

Latex and revertex shipments totalled 8,002 tons against 8,550 tons in May. Of the June total, the UK took 1,942 tons, USA 671, West Germany 873, Japan 1,139, other European countries 2,400, Commonwealth 444 and other countries 533 tons.

United States

The US Department of Commerce reports that imports of natural rubber in March were 24,971 long tons, compared with 22,004 in February, and imports of latex 3,856 long tons, compared with 4,719 long tons in February.

The department has corrected figures given earlier for the consumption of imported synthetic rubber. It is now said that consumption in February was 653 long tons, and in March 983 long tons. The figure for April is not yet available.

Rubber Markets

LONDON

In a quiet market, with incentive lacking, prices followed the slightly downward course at Singapore. Terminal business was mainly of a short-covering nature, while cif demand remained selective. Dealers were reluctant to extend their commitments. The Chancellor's budget proposals left the market temporarily uncertain, but had no quotable effect.

Latest prices are as follows:

No. 1 RSS Spot: 24⅜d.-24⅝d.

Settlement House:

September 24⅜d.-24½d.

October 24⅝d.-24⅞d.

November 24⅞d.-25d.

October/December 24⅞d.-25d.

January/March 25d.-25⅛d.

April/June 25d.-25⅛d.

July/September 25d.-25⅛d.

No. 1 RSS cif basis ports:

August 24¼d.-24½d.

September 24⅜d.-24⅝d.

October 24½d.-24¾d.

Godown:

August 82½ Straits cents.

Latex

Centrifuged 60% latex per gallon in drums, seller, September, October, 14s. 5d., cif European ports. Spot, seller 14s. 10d. Bulk, seller d.w. 14s. 2d. Normal, seller, September, October, 11s. 4d.

NEW YORK

The New York rubber market ruled as under on July 24.

Dealers' Prices

	US cents per lb., ex-dock	
	July 24	Previous
No. 1 RSS, Aug. ..	29¼n	29⅜n
Sept. ..	29¼n	29½n
No. 2 RSS, Aug. ..	29¼n	29½n
Sept. ..	29n	29⅜n
No. 3 RSS, Aug. ..	29n	29⅜n
Sept. ..	28⅞n	29⅛n
No. 1 RSS, Spot ..	29¼n	29⅜n
No. 3 amber blanket crepe, Aug. ..	25⅜n	25½n

Futures—Rex Contract

	July 24	Prev. Close
July ..	29.00a	29.00b–29.10a
Sept. ..	29.12t	29.40t
Nov. ..	29.00t	29.25b–29.33a
Jan. ..	28.70b–28.77a	29.05b–29.15a

Sales: 22. Tendency: B'Steady

Futures traded within narrow ranges and prices eased slightly on July 24.

In the physical market, very quiet conditions prevailed as factory demand was negligible. Cable offerings from the East were reported as light but too highly priced.

SINGAPORE

Lacking a lead from overseas, the market was very slow to open on July 24 and continued quiet in thin trading, but the undertone was fairly steady. Later in the day some profit-taking found buyers reserved. The market closed slightly easier at the lowest level of the morning. Small but persistent selling depressed prices throughout the afternoon. Trading was thin and prices were later held by some short-covering. Lower sheets were in selective demand.

	Malayan cents per lb., fob Malayan ports to open ports	
	July 24	Prev. Close
No. 1 RSS, Aug. ..	84⅜–84½	85 –85⅛
Sept. ..	84⅛–85	85⅛–85⅜
No. 2 RSS, Aug. ..	83⅞–84⅛	83½–85
No. 3 RSS, Aug. ..	83 –83½	83⅛–84¼
No. 4 RSS, Aug. ..	80 –80½	80 –81
No. 5 RSS, Aug. ..	72 –73	72 –73
No. 1 RSS, Spot ..	83⅛–84	84⅛–84⅞
No. 3 blanket thick re-milled crepe, Aug.	70¾-71¾	71¼–72¼
No. 1 fine pale crepe, Aug.	91¼–92¼	92 –93
2X thin brown crepe, Aug.	69 –70	69½–70½

Tendency: Quiet.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob, at 163.80d. per gallon.

AMSTERDAM

The Amsterdam rubber market ruled as under on July 24:

	Guilders per kilo	
No. 1 RMA	July 24	Previous
July	2.29	2.33
August	2.29	2.33
September	2.29	2.33
July/September ..	2.29	2.33
October	2.29	2.33
November	2.29	2.33

Sales: Nil. Tone: Quiet

DJAKARTA

	Rupiahs per kilo	
	July 24	Previous
Spot No. 1 priok ..	33.25b	33.25b
Spot No. 2 priok ..	32.25b	32.25b
Spot No. 3 priok ..	31.25b	31.25b
No. 1 fine pale crepe, Spot	32.00b	32.00b

Tendency: Quiet.

CEYLON

The price of No. 1 RSS at Colombo on July 24 was 101¾ (102¾) Ceylon cents per lb.

BANGKOK

The price of No. 1 RSS at Bangkok on July 24 was 27.12½ (27.12½) US cents per lb.

IRI GOLFING SOCIETY

Continued from page 189

Team Matches

Manchester beat Scotland five to four matches with two matches halved; this was for the Ryan Trophy. Scotland beat London by 7½ to 2½ matches for the Drumnadrochit Tankard and the Garner Trophy was retained by London by 6½ to 5½ matches. In the aggregate, each section won a match, so, as the holders, Scotland, retained the Franklin Trophy.

The Stableford competitions were won by A. Bell, L. Johnson, G. Betts, W. D. Porter and W. Alexander.

Following the competition, the president presided over the dinner and the prize-giving. Having presented the Wallwork Cup to W. Somerville, and other prizes, he went on to thank the Scottish section for the excellent work which had been put into organizing a most successful weekend.

The Scottish captain, replying, thanked all those who had generously donated prizes. A list of the prize donors is given below.

J. H. Carrington, Anchor Chemical Co. Ltd.; Clyde Rubber Works Co. Ltd.; Corrance and Yuill Ltd.; Croxton and Garry Ltd.; R. and J. Dick Ltd.; Distillers Co. Ltd.; Dunlop Rubber Co. (Scotland) Ltd.; P. W. Hall Ltd.; Henry Gardner and Co. Ltd.; Geigy Co. Ltd.; Greengate and Irwell Rubber Co. Ltd.; R. W. Greeff and Co. Ltd.; J. and G. Hardie and Co. Ltd.; Hubron Rubber Chemicals Ltd.; Imperial Chemical Industries Ltd.; Ioco Ltd.; India Tyre and Rubber Co. Ltd.; Geo. MacLellan and Co. Ltd.; North British Rubber Co. Ltd.; J. M. Steel and Co. Ltd.; and James Stott Ltd.

Cable Contract for BICC

British Insulated Callender's Cables Ltd. has been awarded a contract worth £238,000 by the Central Electricity Generating Board for the supply and installation of some 13¼ miles of 132kV. power cable at Cardiff.

This major power link, between Cardiff East and Cardiff West substations, will comprise one circuit of three single-core oil-filled cables with a 0.85 sq. in. copper conductor. The cables will be sheathed with corrugated seamless aluminium with an extruded pvc oversheath.

Vinyl Shoes

Heafield Industries Ltd., of Derby, has been appointed agent for a new range of vinyl boots, shoes and overshoes developed by Freudenbergs of Weinheim, Germany.

Industry INTELLIGENCE

Technical Data

Polypropylene Wire Coverings

Electrical and physical properties of Tenite polypropylene formulas developed for solid and cellular coatings of wire are described in Technical Report No. 7, issued by Eastman Chemical Products Inc., Kingsport, Tennessee.

The report detailing typical extrusion conditions for both types of coating, also presents comprehensive information, accompanied by diagrams, on techniques for applying the plastics material to wire and the equipment required.

The high dielectric strength of solid Tenite polypropylene, which has excellent surface hardness and good resistance to abrasion, permits the use of thin coatings and heightens the latitude for running multiple wires through conduits and jackets.

Possessing roughly half the density of solid polypropylene, the Tenite polypropylene cellular coating has a lower dielectric constant than the solid coating while retaining, to a considerable extent, its capacity to resist abrasion and to withstand normal processing, handling and usage.

Rigid Urethane Foam

Technical Information Sheet Urethane PC/U 26 issued recently by the Polymer and Chemicals Service Department, Dyestuffs Division, Imperial Chemical Industries Ltd., supersedes two previous sheets — Urethane PC/U 16 and 23.

This sheet describes the manufacture and properties of pre-formed sections of pipe insulation, for the thermal insulation of pipe. These can conveniently be formed from rigid polyurethane foam by the use of Daltolac 41 and Suprasec D. The foam so produced has a high closed cell content, and its resistance to heat and low coefficient of thermal conductivity make it useful for insulating piping over a wide temperature range. Low density foams may be produced and the fast reaction rate allows a rapid turn round of moulds.

Royalite ABS Sheet

US Royalite nitrile thermoplastic sheet is marketed in the UK by The North British Rubber Co. Ltd., 204-8 Tottenham Court Road, W.1.

A recently-published booklet available from the above address, describes the properties and applications of this tough versatile material. Advantages claimed are that it is attractive in appearance, light in weight, available in flexible or rigid grades, highly chemical and grease resistant, non-magnetic, electrically non-conductive and odourless.

Royalite sheet is available in 13 colours, with smooth or grained surface finish and in standard thicknesses from 0.025in. to 0.25in., and on special orders up to ½in.

Information is also given in the booklet on forming methods and on workshop practices including cutting, punching and drilling, marking and colouring of selected areas.

Machines, Materials and Equipment

Elapsed Time Meter

A new elapsed time meter for recording the time a piece of equipment has been in use is being produced by The English Electric Co. Ltd., Strand, W.C.2. It can be applied to any equipment used intermittently and on which planned maintenance or a time log is required. The meter is normally connected so that it is automatically switched on and off with the apparatus being metered and it can register up to 9999.9 hours in steps of 0.1hr. The cyclometer register is driven by a self-starting, non-reversing, synchronous motor, through a train of gears. Operation is on AC supply in the voltage ranges 100-125, 200-250, and 400-440. The frequency can be 50 or 60 cycles.

The meter is available in two case types.

The first, type H21M, is a 4in. sq., flush mounting, switchboard pattern case with the motor mounted internally. The second is a 2½in. or 3½in., type S25 or S35, square moulded case designed primarily for panel mounting. The motor is mounted externally and connexion to the supply is made via a pair of flexible leads.

Copper Laminating Foil

A new laminating adhesive-coated copper foil which is manufactured by St. Regis Paper Co., USA, is distributed in this country by Omni Ltd., 35 Dover Street, W.1, from whom samples and data sheets are available.

Four grades of the material are available including 1oz. and 2oz./sq. ft., and these all conform with NEMA specifications and tolerances. Copper purity is 99.5% minimum (silver considered as copper) and the material is supplied in sheets up to 47in. wide and 84in. long, or in rolls containing up to 1,000ft. of 1oz. copper and 500ft. for 2oz.

The coating adhesive is claimed to be applied evenly enough to eliminate any objectionable results from thickness variations and the foils are suitable for the production of paper/phenolic or epoxy/paper/glass laminates.

Publications

I.C.I. Vinyls

Three information service notes on pvc have recently been issued by the Technical Service and Development Department of the Plastics Division of Imperial Chemical Industries Ltd., and copies of these are available from I.C.I. Sales Offices. They are numbers 800 (which supersedes IS685), 807 and 820.

IS800 describes Welvic pvc compounds and masterbatches. The range of Welvic compounds available is made up of a large number of compositions of different characteristics to cover a wide range of applications and special compositions can be made up to satisfy conditions required for specific applications, for which none of the standard compositions is suitable.

IS807 is a bibliography on pvc for the years 1955-1960. It lists articles published in journals during this period, to assist enquirers who wish to refer to the latest developments in vinyl technology. Since the applications of vinyl polymers and copolymers cover such a wide range of subjects, the classification of these articles is rather broad. There are 37 groups including an unclassified section and references to some articles are duplicated under different headings.

IS820 deals with Corvic paste-making polymers and latices, of which there are three main types; granular or suspension, emulsion and paste making. Chemically these are very similar but there are considerable differences in their particle structures resulting in very different behaviour during processing.

Asbestos and Glass from Turners

Turner Brothers Asbestos Co. Ltd., Rochdale, has recently issued two new publications covering the products supplied for moulding and reinforcing plastics, published under the following titles: Durestos Resinated Asbestos Moulding Materials Booklet (SA.6); Duraglas Glass Fibre Reinforcements Booklet (D.6).

Durestos is a moulding material manufactured from intimate blends of asbestos and thermosetting resins and is available in three forms — felt, flock and powder. The booklet describes the use of this material for high-pressure, low-pressure and no-pressure moulding techniques, together with details on machining moulded components.

The properties of Duraglas are fully described in this publication covering glass fibre products. Details of woven fabrics, tapes, chemically and mechanically bound mat, woven roving, roving, chopped roving, flock and webbing, are included together with illustrations of some recent fabrications.

COMPANIES in the NEWS

Francis Shaw and Co. Ltd.

At the annual general meeting of Francis Shaw and Co. Ltd. held in Manchester recently, Dr J. G. Mackay, the chairman, said that efforts to improve efficiency in the company had been directed at the engineering department, which was being strengthened and reorganized. Substantial changes in procedure had been recommended by a firm of industrial consultants and were now being carried out within the works. Steps had been taken to increase efficiency and reduce costs. The big expansion in the company could be illustrated by the fact that sales were now 2½ times greater than in 1956.

Lintafoam

Lintafoam Industries is to buy the capital of Marshall and Brush of Dundee for the equivalent of £200,000.

Lintafoam profits, before tax, are estimated at £120,000 for the year ended June 30 1961 and if confirmed it is intended to pay a 20% final to make 30% for the year, against 10% previously.

Marshall and Brush, with net assets of £190,002, has worked closely with Lintafoam recently in the development and marketing of foam-backed carpets and rugs.

Export Opportunities

Plastics Piping for Bahamas

The Bahamas Supply Co. Ltd. has informed the UK Trade Commissioner that it is interested in receiving from manufacturers quotations for 2in. or 4in. plastics piping for distribution of drinking water.

The company is an importer and distributor for a wide range of goods. It acts as agent for certain UK manufacturers, in particular of building materials. The company's interest in establishing a source of supply in the UK for water piping would be for general importing and distribution and is also related to the needs of a large development project involving 1,400 acres.

Interested manufacturers should write to the Bahamas Supply Co. Ltd., P.O. Box 1419, Nassau, Bahamas, providing full information of what can be offered. They should also inform the UK Trade Commissioner, P.O. Box 393, Kingston, Jamaica, that they have done so (ESB/21515/61).

Asbestos Shipments

Shipments of asbestos from Canadian mines were up slightly in April 1961, but as a result of earlier declines, the shipments for the period January-April were lower.

Shipments in April amounted to 96,326 tons, compared to 96,053 year earlier and in the first four months this year 288,457 tons, compared to 300,847 year ago, a decline of 4.5%.

Shipments from mines in Quebec were smaller in April at 90,387 tons, against 90,775 year ago, and also smaller in the four months at 265,127 tons, compared to 278,225.

NEW COMPANIES

Featherpak (Christchurch) Ltd. (695,609). June 15. Capital: £100 in £1 shares. To carry on the business of fabricators of expanded polystyrene and cellulose acetate sheeting packs, packages and packagings of all kinds, etc. The directors are to be appointed by the subscribers.

Heddon Plastic and Print Co. Ltd. (695,265). June 12. Capital: £100 in £1 shares. The directors are: Horace R. Cole, 5 Manor Road North, Wallington, Surrey; Henry W. Smith, 26 Kings Avenue, Carshalton Beeches, Surrey; Cecil H. Holmes, Belfairs, Pond Road, Woking, Surrey. Regd. office: 3 Heddon Street, W.1.

Tinker Grayson Ltd. (695,569). June 14. Capital: £1,000 in £1 shares. To carry on the business of plastics moulders, etc. The first directors are to be appointed by the subscribers.

Plastic Sales Leicester Ltd. (695,655). June 15. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics materials, etc. The first directors are to be appointed by the subscribers.

Bowran (Plastics) Ltd. (695,362). June 13. Capital: £100 in 1s. shares. To carry on the business of manufacturers of, and dealers in, vacuum cleaners and components, parts and accessories used in connexion therewith; processors of plastics substances and materials, etc. The directors are: James Williams, 41 Primrose Gardens, Hampstead, N.W.3; Jack Bowran, 50 Cyprus Avenue, N.3.

Frank Marsh Ltd. (695,196). June 12. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, rubber, rubber substitutes, etc. The directors are: Francis B. Marsh, 48 Patricia Avenue, Goldthorn Park Estate, Wolverhampton; Leslie Pugh, 69 Catholic Lane, Sedgley, near Dudley; John G. Canadine, Five Oaks, Rudford Lane, Compton, Wolverhampton.

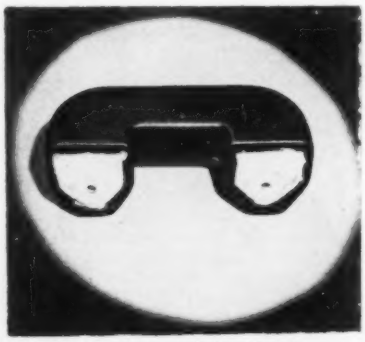
Automated Moulders Ltd. (695,902). June 19. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics, etc. Regd. office: Finsbury House, Blomfield Street, E.C.2.

Brockelbank Plastics Ltd. (696,050). June 20. Capital: £100 in £1 shares. The directors are to be appointed by the subscribers. Regd. office: Mart Lane, Burscough, Lancs.

R. Bartlett and Co. Ltd. (696,168). June 21. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics materials, etc. The directors are: Reginald R. Bartlett and Mary Homer, both of 22 Treswell Road, Dagenham. Regd. office: 452 Barking Road, E.13.

Lisney Products Ltd. (696,182). June 21. Capital: £100 in £1 shares. To carry on the business of importers, exporters and manufacturers of, and dealers in, merchandise of all kinds, including plastics, etc. The directors are: Raymond G. L. Holder, 33 Manor Road, Thundersley, Essex; Cecil Salmon and Trevor C. Salmon, both of 11 Moseley Street, Southend-on-Sea. Regd. office: 33 Manor Road, Thundersley, Essex.

Park Designs Ltd. (696,449). June 23. Capital: £5,000 in £1 shares. To carry on the business of designers, manufacturers and distributors of, and dealers in, metal and plastics fabrications, including component parts for the electrical and fashion trades, etc. The directors are: Jack A. Bearman, 27 Brockley Avenue, Stanmore, Middlesex; Alexander Cohen, 18 Courtleigh Gardens, N.W.11. Regd. office: 16 Wimpole Street, W.1.



Armrests of moulded polyether are used in the new Ford Consul Classic convertible — the first time that the material has been used for this type of work. The polyether is moulded directly on to a metal insert and bonded to a vinyl skin providing a firm armrest with fixing holes preformed in the moulding

Increases of Capital

Davies Tyre House (Chester) Ltd. (461,320), Ivy Rock, Vicars Cross, Chester. Increased on November 3 1960, by £10,000 in £1 preference shares, beyond the registered capital of £80,000.

West End Mouldings Ltd. (629,028), plastics moulders, etc., 184 Aldersgate Street, E.C.1. Increased on September 26 1960, by £5,000 in £1 shares, beyond the registered capital of £5,000.

J. C. B. Tomlinson Ltd. (531,469), rubber manufacturers, etc., 10/13 Dominion Street, E.C.2. Increased on October 11 1960, by £19,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Haffenden-Richborough Ltd. (675,198), manufacturers of rubbers and plastics goods, precision engineers, etc., 9 Clarges Street, W.1. Increased on December 1 1960, by £299,900 in 750,000 'A' ordinary and 749,500 'B' ordinary shares of 4s. each, beyond the registered capital of £100.

Cannon Rubber Manufacturers Ltd. (313,835), Ashley Road, Tottenham, N.17. Increased on October 12 1960, by £150,000 in £1 shares, beyond the registered capital of £150,000.

Warren Rubber Holdings Ltd. (672,071), 17 St. Helen's Place, E.C.3. Increased on November 7 1960, by £449,900 in 2s. ordinary shares, beyond the registered capital of £100.

Plastikair Ltd. (655,886), plastics manufacturers, etc., 180 Bethnal Green Road, E.2. Increased on October 26 1960, by £400 in £1 ordinary shares, beyond the registered capital of £100.

Changes of Name

Frank Symington Ltd. (336,421), dealers in tyres, etc., 291 High Street North, E.12. Name changed to Apex Vulcanisers Ltd. on November 15 1960.

G. H. Osborn Building Products Ltd. (577,322), 4 Dollis Park, N.3. Name changed to Osma Plastics Ltd. on December 21 1960.

P. B. Cow (Slough) Ltd. (576,822), 5 Falmouth Road, Trading Estate, Slough. Name changed to P. B. Cow (Plastics) Ltd. on January 2 1961.

Sutton Packing and Woodworking Co. Ltd. (431,037), Almex Buildings, Watery Lane, Birmingham, 9. Name changed to Sutton Plastics Ltd. on November 11 1960.

Kuala Lumpur Rubber Co. Ltd. (88,831), 53 Eastcheap, E.C.3. Name changed to Kuala Lumpur-Kepong Amalgamated Ltd. on November 24 1960.

Lea Bridge Industries (Bridgend) Ltd. (503,819), manufacturers of rubber, fabric, rubberized fabric, etc., 6H2 David Street, Trading Estate, Bridgend, Glam. Name changed to Mayday Equipment Ltd. on August 5 1960.

British Rubber Producers' Research Association (WLO) (336,256), 19 Fenchurch Street, E.C.3. Name changed to Natural Rubber Producers' Research Association on July 29 1960.

Plastic Extrusions Ltd. (408,769), 3 Red Place, Green Street, W.1. Name changed to Arleston Property Co. Ltd. on August 4 1960.

Latest Wills

Walter Gerald Turner Packard, of Broadwaters, Harkstead, Ipswich, formerly of Sutton, Suffolk, late chairman of Dindings Rubber Estate Ltd., Ipswich, who died on March 5 1961, aged 80 years, left £50,380, net value.

Mark Brickhill, of Bewdley, Congleton Road, Alderley Edge, Cheshire, chairman of Universal Metal Products Ltd., plastics moulding manufacturers, and of other companies, who died on April 8 1961, aged 93 years, left £239,974 net value.

Otho Alfred Harold Heathcote, of 14 Woodchurch Road, Hampstead, N.W., formerly c/o Grindlay and Co., 54 Parliament Street, Westminster, late rubber planter, who died on September 3 1960, left £8,319 net value.

Gerard George Cole, of 227 Perry Street, Billericay, Essex, engineer, who died on January 28 1961, left £8,528 net value.

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APPLICATIONS are invited for the position—foreman, extrusion department of a rubber company in Surrey. Pension and bonus schemes in operation.—Write in confidence, giving full details of age, experience and present salary to Box 1195. (1195)

CHEMIST/TECHNOLOGIST required for control and development work in spreading, calendering and adhesives field. Applicants with practical knowledge of PVA coating preferred. Should possess an LIRI and DPI as minimum qualifications. Salary will be in accordance with qualifications and experience.—Written applications giving employment history should be addressed to Lindsay and Williams Limited, Cable Makers' Supplies, Manchester, 11. (1197)

PRECISION Rubbers Limited, Bagworth, Leicester, have a vacancy for a young engineer to undertake development in connection with the production of precision rubber engineering components. The post provides considerable scope for one with initiative and would be filled best by someone with experience in the rubber industry, although this is not an essential requirement.—Apply in writing, giving age, particulars of education, training and qualifications, to the Technical Director. (1198)

RUBBER technologist, age 23-35, required for work in the field of specialised synthetic rubber components. Ability to deal practically with technical enquiries and production problems essential. Good prospects can be offered to one with initiative.—Applicants should write, giving full details of age, education, training and experience to the Technical Director, Precision Rubbers Limited, Bagworth, Leicester. (1199)

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required, to take charge of a team engaged on compounding research and physical test development, applied to a range of polymer types. Salary according to experience, ability and qualifications. This is an interesting opportunity for an ambitious man to gain wide research experience and to publish papers.—Apply to Dr. Falconer Flint, Director of Research, Factice Research and Development Association, 12 Brook Road, Fallowfield, Manchester, 14, or by telephone to RUSholme 5198. (408)

TECHNOLOGIST required, age 25-35. Full Technological Certificate City and Guilds (Paint Technology) or HNC Chemistry. Experience in industrial finishes especially technical service. Salary from £800 according to experience and ability. Knowledge of high polymers an advantage. West of England coating specialists. Modern laboratory. Pension scheme. An attractive position with prospects in an expanding organisation. Box 412. (412)

TIME study Engineer. A medium-sized company near Manchester requires a senior time study engineer capable of developing the functions of an existing department; experience in all aspects of time and method study, incentive schemes and rate fixing essential; knowledge of the engineering and/or rubber industry would be an advantage; age 30 upwards; pension scheme in operation.—Please state brief details of qualifications and experience to Personnel Manager, Box 404. (404)

TUTOR required by correspondence college. Rubber technology to standard of LIRI syllabus. Part-time only. AIRI qualification essential.—Apply Box 405. (405)

WE need a young, go-ahead, practical supervisor to take charge of our small moulding section. We offer £750 p.a. to commence, good promotion prospects and assistance with housing to an enthusiastic man who is not afraid of hard work. —Apply giving full details of age and experience to date to Box 407. (407)

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'COTSWOLD' dipping machines and circulating tanks for latex and PVC. New catalogues now available on request. —Lionel Hook and Sons, Ebley, Stroud, Glos. Tel.: Stonehouse 614/5. (380R)

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RECONDITIONED second-hand jacketed vulcanising pan, 5ft. dia. x 10ft. long, boltless type door, 80 p.s.i. W.P., condition as new.—Box 1185. (1185)

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